The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Professor Green's Resignation

SURPRISE was caused early this week by the announcement that Professor A. G. Green had resigned the position of director of research and chief chemist to the British Dyestuffs Corporation. The reported reason for this act is "his dissatisfaction at the absence of technical knowledge upon the board of directors and his belief that the permanent establishment of the dyestuffs industry in this country is impossible under these conditions." A popular impression exists that the professor's action will have a revolutionary effect on the policy of the Corporation and involve an irreparable loss to its technical service. There is no ground, fortunately, to anticipate either result. All the staff will sincerely regret the withdrawal of so distinguished and respected a colleague, but the work will proceed in the competent hands of those who remain. Nor, so far as one can judge, is his resignation likely to produce any departure from a well-considered policy which is steadily justifying itself by results.

Beyond the brief explanation already given, neither side has publicly stated its case. It may be safely assumed, however, that the disagreement relates to two points—finance and management. On the first, there is a passage in the Chairman's speech at the last annual meeting which supplies a clue. It shows that during the four years ended October 31 the Corporation spent over £400,000 on research. A yearly average of £100,000 seems a generous expenditure indeed compared with a balance of profit last year of only £102,656. It was further stated:—

> Much of this expenditure has been incurred in establishing the constitution of colours not previously made in this country, and in working out processes for the manufacture of the new and necessary intermediate products. This field has now been well covered, and expenditure in this direction is diminishing. Henceforth our principal aim will be to utilise our research organisation for the purpose of securing better efficiences and increased yields of products in actual manufacture and of introducing such new colours as are in steady demand by the consuming trades. It is with this object that the consolidation of our technical staffs has been carried out, and your Directors feel that the time has come when further economies can be effected in our research department.

Here one can see the possibility of a sharp difference between the man of science (often an uncommercial idealist) and the responsible commercial administration which has to accommodate ideals to financial resources. The one might honestly regard any curtailment of pure research almost as sacrilege; the other has to relate the cost of research to the cost of all the other departments, and to limit it, whether he likes it or not, to what is financially practicable. The question of the selling cost of British dyestuffs is extremely important, and if the costing system shows that an expenditure of £100,000 a year on research represents too high an addition to the selling price of each dyestuff produced, then, unless the Corporation has unlimited funds (which it has not), retrenchment may be imperative. We understand, moreover, that Professor Green is keen on pure research beyond what even Germany is undertaking. An excellent ambition, but the more urgent need may be to catch Germany up in commercial production rather than to excel Germany in theoretical knowledge. We are, of course, only speculating, but if the board, in pursuance of the hint dropped at the annual meeting, propose to restrict theoretical research in order to advance and consolidate commercial production, it is conceivable that the pure research director might be honestly affronted, and decide on principle to resign rather than surrender a single member of his staff.

Then there remains the ticklish question of control. Should the director of research, for example, be an autocrat, exempt from authority, or should he be subject to the central control which has to correlate all the sections of a great working organisation? We can see no reason why research should be treated as something sacrosanct, any more than salesmanship or any other department. Temperamentally, the true researcher, like the true artist, hates all restraint; his instinct is to work as the spirit moves him. An admirable spirit it is, but often difficult to reconcile with commercial necessity, and requiring therefore to be

directed by a strong business brain. Whether Professor Green stands for the autocracy of the pure research department we cannot say, but admittedly he does stand for technical knowledge on the board. If this means the inclusion of himself or of some other technical director on the board, it does not follow even then that the technical view of the situation would always prevail; it might mean, however, that the technical man would be so obsessed with his own sectional point of view as to be quite unable to take the all-round view of more practical commercial colleagues.

Looking at the case all round, it appears as if the conflict were between technical autocracy and central commercial control; between one department independent of the rest and a co-ordinating authority dominating and correlating all departments in the interests of the whole organisation. The policy of co-ordination and central administrative control seems to us the only one possible. It has already produced remarkable results. If any doubt remains, the evidence supplied in recent speeches by so competent an authority as Dr. Levinstein himself as to the progress of the British Dyestuffs industry should finally dispel it. It is a splendid scientific ambition to get ahead of Germany in new research; it may be better business to catch Germany up in commercial production first. Research to the intensive technical mind may be everything; to those responsible for an entire organisation it is one of many things, all of which require proportionate consideration and must accept the condition of proportionate finance. Only so can the success of the whole be achieved.

Industrial Acetylene and Alcohol

ACETYLENE has long been recognised as a valuable starting point for manufacturing organic compounds synthetically, and the attention of inventors and chemists has frequently been turned to the perfection of the methods of converting acetylene to the more sought-after compounds such as alcohol or acetic acid. A very large number of processes have been patented in various countries, and many of these conversions have proved economically practicable. This is clearly brought out in an article in the July issue of the French review, *Chemie et Industrie*, by M. A. Guyot, the scientific director of the Compagnie des Produits chimiques et electro-metallurgiques d'Alais, Froges, et Camargue, an abstract of which appears on another page. In the concluding remarks of the author it is pointed out, however, that these processes are hampered, not through any inherent difficulty, but simply by the high cost of producing acetylene by the carbide method.

At first sight the production of carbide would seem simple enough, requiring, as it does, only comparatively inexpensive raw materials—lime and coke, the former of which may be recovered when the carbide is converted to acetylene. The cost of the process, however, arises in the large expenditure of electric energy required to produce the carbide. In view of this fact it is unlikely that cheap acetylene will ever be practicable until some other method of production has been devised. The attention of investigators has already been directed to this problem, and it is to be hoped that they will eventually be successful. Until this end is achieved a number of promising methods must wait, the most important of which is probably the production of artificial liquid fuel in the form of either paraldehyde or alcohol. To the organic chemist the prospect of readily obtaining such products as monochloracetic acid free from impurities in the form of di- and trichlor derivatives is but one of the attractions of cheap acetylene.

Another suggestion by the author is particularly interesting, namely, that in view of the present cost of acetylene industrial alcohol could be obtained commercially from ethylene. Since ethylene is present in coal gas and coke-oven gas to a considerable extent, against the cost of manufacturing acetylene there need only be set the cost of extracting the ethylene, while the actual production of alcohol from ethylene is considerably simpler than from acetylene. The author is, however, of the opinion that it is unnecessary to go so far as to produce alcohol from acetylene, since paraldehyde is less costly to obtain and is practically equivalent for power purposes. Ethylene, it is pointed out, is a by-product in processes of the type recently patented by M. Georges Claude for obtaining hydrogen for the synthesis of ammonia from coke-oven gas. The author's conclusion, it is interesting to note, is that before long alcohol obtained from ethylene will certainly be on the market. This would seem to be a possibility, and it is to be hoped that this country with its advantages in the way of coal supplies will not lag behind in the establishment of what should be a new and profitable industry, which in turn would lead to the development of the chemical industry as a whole.

The Case of the Unemployed Chemist

IT is noteworthy that in the same week the familiar problem of unemployment among chemists should be revived from three different quarters. Mr. W. Rhys-Davies writes to some of the Northern dailies pointing out the excess of supply over demand, due largely to the tempting prospects held out when chemistry was suddenly discovered to be the science which had won the war, and which must open out new fields of industry in the period of peace and prosperity that was expected to follow. Next, in terms so remarkably similar as to point to a common authorship, the British Association of Chemists, in the "Editorial" to its latest Bulletin, reminds us of the same problem, and adds a few sound reflections. Finally, we have from the Institute of Chemistry a synopsis of lectures delivered by that good friend of all chemists, old or young, Mr. Richard B. Pilcher, the Registrar, and published as a pamphlet under the title "Chemistry as a Career." Lest people should imagine that the whole profession is in a state of destitution, unrelieved by doles or other providential aids, it may be as well to say at once that the same story has been heard before. In spite of it one still occasionally meets members of the craft who appear to dine and dress quite well. The story is heard periodically of all professions, as periods of depression and exceptional strain come to each in turn. The chemical manufacturer and the chemical merchant, no less than the chemist pure and simple, have their times of difficulty; yet, somehow, all ultimately survive! So when we hear that the number of qualified chemists exceeds the number of appointments and that many accomplished young men are without

obs let us not yield to panic, but remember that it has all happened before.

None the less, one feels a genuine touch of sympathy for young men who have worked hard and spent their parents' savings on qualifying themselves for the practice of chemistry and now find themselves idle. It is worth while to try to discover the cause and to avert the effects. But while the facts are admitted, it is not so easy to apportion the blame. Mr. Rhys-Davies lays it partly on those who spoke after the Armistice in almost lyrical terms of the attractions and rewards of a chemical career, and partly on those technical institutions and universities which provide such excellent instruction in the science. Yet it is against all precept for seats of learning to turn disciples from their doors, and one cannot believe that any deception is practised to attract them. Nor are the people who honestly believed chemistry to be one of the great fields of the future and desired to see a strong British school of chemistry created any more to be blamed. When it comes to remedies, Mr. Rhys-Davies does not carry us far. Neither does the B.A.C. help much beyond laying down the excellent principle that the fundamental qualification for entry to the profession must be a thoroughly sound training in the principles of the science. On that all will agree; yet it does not dispose of the case of the thoroughly qualified man who, equally with the partially qualified, remains unemployed. Competence, in any event, is better than incompetence. The trouble is that even admitted competence does not always command a salary.

When we come to Mr. Pilcher we find no vague generalisations as to who or what is responsible for the present situation, nor yet any easy and comprehensive panacea. Like a practical man he sets out clearly the various branches of useful work which are open to the chemist and the qualifications for obtaining employment and success in them. One suspects that in his early days he must have been familiar with Samuel Smiles; at any rate his remedy is to be found in self-help—competence, application, initiative, and applied common-sense. His closing words, so excellent in spirit and in expression, offer advice that could scarcely be bettered. "There is a tendency in all professions towards overcrowding, but there is always room for the best in every profession. Some may have means or influence: the most valuable influence which a chemist can possess is the good opinion of those with whom he has actually worked, and the testimony of those who can speak of his work from first-hand knowledge. Yet influence is of little avail without true worth: it may help him for a time, but in the end he must make his own way." There Mr. Pilcher touches the spot. The chemist must not rely on providence or benevolent associations: he must make his own way!

"C. A." Copies out of Print

From scientific and educational institutions and from professional and works chemists we frequently receive applications for copies of The Chemical Age, which are needed to replace missing numbers for permanent filing and binding. While always desirous of assisting readers in this way, it should be pointed out that several issues during the past year were completely exhausted within a few days of publication, and that considerable difficulty is often experienced in obtaining missing copies. This, in fact, has only been possible in several instances by re-purchase from subscribers at prices ranging in one instance up to 7s. 6d. Subscribers who bind The Chemical Age, as the majority do, are advised, therefore, to preserve the copies weekly, as replacement is not always possible. This is the more important as we are informed that in works it is common for copies to be passed from hand to hand, and read in succession by several members of the technical staff, and also for cuttings of Patent abstracts, technical articles, etc., to be taken for departmental files. A little attention to this matter on the part of the staffs may save trouble and disappointment at a later stage.

Points from Our News Pages

Abstracts are published from a new report issued by the Research Department, Woolwich, on the determination of the viscosity of cellulose (p. 222).

Dr. H. E. Watts contributes some "Notes on the Nitrogen Position in Germany." (p. 226).

The resignation is announced of Professor A. G. Green, Director of Research and Chief Chemist to the British Dyestuffs Corporation (p. 227).

The third instalment of "Random Reflexions by a Random Reader" deals with "The Sope-Mystery" (p. 228).

The possibilities of acetylene as a commercial synthetic agent are dealt with in an abstract of an article by M. Guyot (p. 229).

Views on unemployment among chemists are published from Mr. R. B. Pilcher, Mr. W. Rhys-Davies, and the B.A.C. (p. 231).

Business during the past week has shown a little improvement, states our Scottish Market Report (p. 239).

In the London Chemical Market inquiry is maintained, although actual business is still far from good (p. 239)

Books Received

The Viscosity of Cellulose. R. D. Report No. 22 (Part III). London: H.M. Stationery Office. 1s. 9½d.

Chemistry as a Career: A Synopsis of Lectures given by the Registrar before College Chemical Societies during 1921-1923. London: Institute of Chemistry of Great Britain and Ireland.

The Calendar

Aug. 31 to Sept. 22	Shipping, Engineering and Machinery Exhibition.	Olympia, London.
Sept. 10-13	Institute of Metals: Annual Meeting.	Manchester.
12-19	British Association for the Advancement of Science: Ninety-first Annual Meeting.	Liverpool.
17	Institution of Rubber Industry. 8 p.m.	Engineers' Club, London.
17-18	Iron and Steel Institute	Milan
Oct. 6	West Yorkshire Metallurgical Society: Annual Meeting	Huddersfield

Determination of the Viscosity of Cellulose

In Part III. of R.D. Report No. 22 (H.M. Stationery Office, 1s. 9d.), published by the Research Department, at Woolwich, the account of the work on the viscosity of cellulose described in Part II. is continued. This shows the advantage of removing the air from the dissolving bottle by alternate evacuation and filling with hydrogen, thus allowing the solution of the cellulose to be effected in an atmosphere of hydrogen, and this forms the basis of the method of filling described in the present report. Several other causes of inaccuracy in the old method have also been investigated and to a large extent eliminated. The work described in the report has been carried out under the immediate direction of Dr. A. Forster.

THE determination of the viscosity of solutions of cellulose in cuprammonium hydroxide by means of the Falling Sphere Viscometer is described by Gibson and Jacobs (*J.C.S.*, 1920, 117, 473), by Gibson, Spencer and McCall (*J.C.S.*, 1920, 117, 479), and by Joyner (*J.C.S.*, 1922, 121, 1511, 2395). The

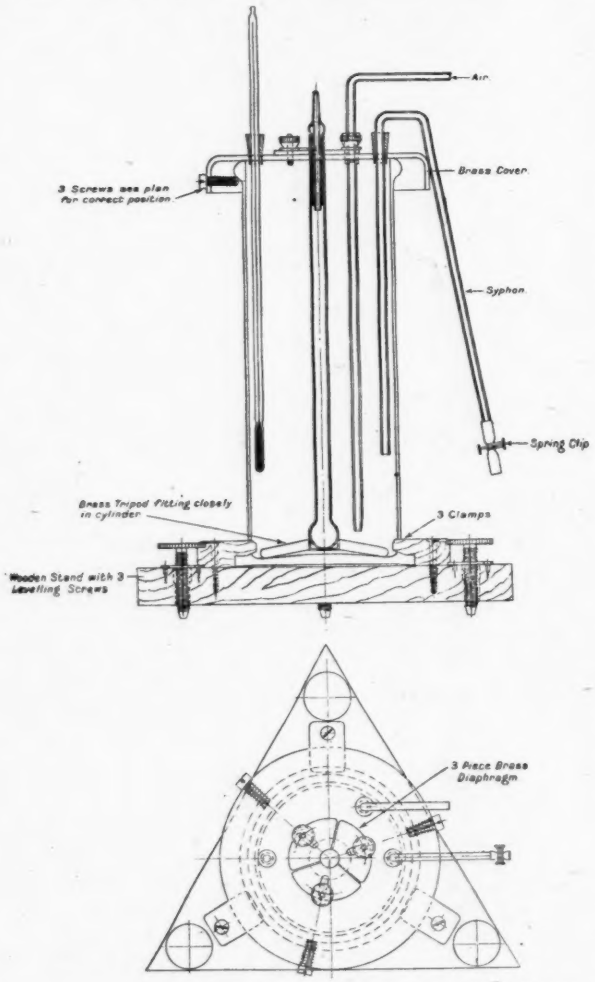

FIG. 1.—CELLULOSE CUPRAMMONIUM VISCOSITY DETERMINATION: DISSOLVING BOTTLE-FILLING APPARATUS.

method described by Gibson and co-workers has now been in general use at the Research Department for some years, and, as a result of the experience gained, modifications have been made which simplify the method and reduce the possibilities of error.

Most forms of cellulose have been found to be irregular in viscosity throughout their mass, as, for instance, all cotton celluloses, both before and after purification. Hence sampling must be on a large scale, and the bulk sample must be cut to a small degree of division and well mixed. Notwithstanding all precautions, occasional erroneous results still occur in using this method, sometimes as many as 1 in 5, due possibly to the above-mentioned irregularities. Matted or tangled forms of cellulose require thorough separation of the fibres to ensure the formation of solutions free from insoluble gelatinous clots. Wood cellulose in lump or paper form (except tissue), even when teased out by hand, does not dissolve completely in cuprammonium hydroxide solution.

A high-speed disintegrator or teaser separates the matted and tangled fibres into a form which dissolves rapidly and completely and thoroughly blends irregular forms. Cotton samples so prepared showed no irregularities, and gave more uniform viscosity figures than cottons cut and mixed by hand. It has been found that the use of boiling water or dilute alkali solutions, although improving the clarity of the cellulose solution, reduces the viscosity markedly, and consequently is inadmissible. For the same reason, drying at elevated temperatures is to be avoided (Table III.).

Preparation of Cuprammonium Solution

The preparation of cuprammonium solution described in R.D. Report No. 22, Part II., is tedious, and difficulty is sometimes encountered in making a solution containing the specified quantity of copper. A more convenient method of preparation is to dissolve copper sulphate or basic carbonate in ammonia solution, adding during vigorous shaking the equivalent amount of baryta dissolved in its own weight of water at 95° C. Both of these methods, however, have the disadvantage that they are cumbersome on a large scale, and the solutions obtained are unstable when the copper is higher than 11 gm. per litre, due perhaps to the presence of traces of alkali or other impurities.

Of the cuprammonium compounds, only the hydroxide appears to dissolve cellulose. The presence of acid radicals or of carbohydrates inhibits the dissolving power of equivalent amounts of cuprammonium hydroxide with which they combine. Salts of other bases appear to be decomposed by cuprammonium hydroxide forming cuprammonium salt and free base. When the amount of free cuprammonium hydroxide is constant, small variations in the amount of extra cuprammonium salts do not appreciably influence viscosity. The presence of alkaline earths even in traces, and of some metals (zinc), inhibits the solution of cellulose in cuprammonium hydroxide. The presence of alkali accelerates the decomposition of the cuprammonium solution.

Basic copper salts dissolved in ammonia solution readily dissolve cellulose. They are approximately twice as soluble as cupric hydroxide, basic copper carbonate being the most soluble. The ammoniacal solutions are to be regarded as mixtures of cuprammonium hydroxide and cuprammonium salts in solution, the hydroxide being the cellulose solvent. A small residue of undissolved cupric hydroxide remains and renders control of the composition of the solution difficult. Moreover, the solution is too dark for easy observation during the viscosity measurement.

The action of air and ammonia solution on pure copper affords a convenient method for preparing cuprammonium hydroxide in large quantities. It has been found that the traces of carbonate always present in commercial ammonia retard the solution of the copper. Carbonate-free ammonia solutions, obtained by absorbing ammonia gas in pure water, dissolve the copper much more rapidly and consequently with less nitrite formation, giving a solution free from cuprammonium carbonate. The solution of the copper is more rapid with dilute solutions of ammonia. Using the specified strong ammonia solution necessary for the formation of good cellulose solutions, about 10 gm. of copper per litre is rapidly dissolved, the amount increasing after continued action to about 12 to 13 gm. of which 11 gm. of the copper is present as hydroxide. This concentration is difficult to exceed, even after prolonged action, except with the formation of large amounts of nitrites.

A solution containing 11 gm. per litre of copper as cuprammonium hydroxide satisfactorily dissolves 2 per cent. of cellulose, and this has been found a convenient standard con-

centration for comparative viscosity determinations. Such solutions, while being stable and clear, due possibly to the absence of alkali, have been found to contain fairly constant small quantities of cuprammonium nitrite and a trace only of nitrate. It has not been found possible to prevent the formation of these nitrites; they do not, however, influence appreciably the solvent action of the cuprammonium hydroxide, or the viscosity of the cellulose solution (Table IV.), and by allowing for them a standard solution of cuprammonium hydroxide can be ensured. A solution so prepared and standardised has been found to give the same viscosity with the same cellulose as a solution containing the same amount of ammonia and cuprammonium hydroxide prepared by the methods described in R.D. Report No. 22, Part II. (*see* Table V.).

It has been found that the effect of variations of copper and ammonia content in the cuprammonium solution on the viscosity of cellulose (Table VI.) is so considerable that in order to avoid too great an experimental error, the cuprammonium hydroxide and especially the ammonia must be within closer limits than hitherto specified. It is important that the cuprammonium solution be prepared, stored, and maintained during the preparation of the cellulose solution strictly within these limits. The loss of ammonia by diffusion and evacuation in the method formerly in use is high.

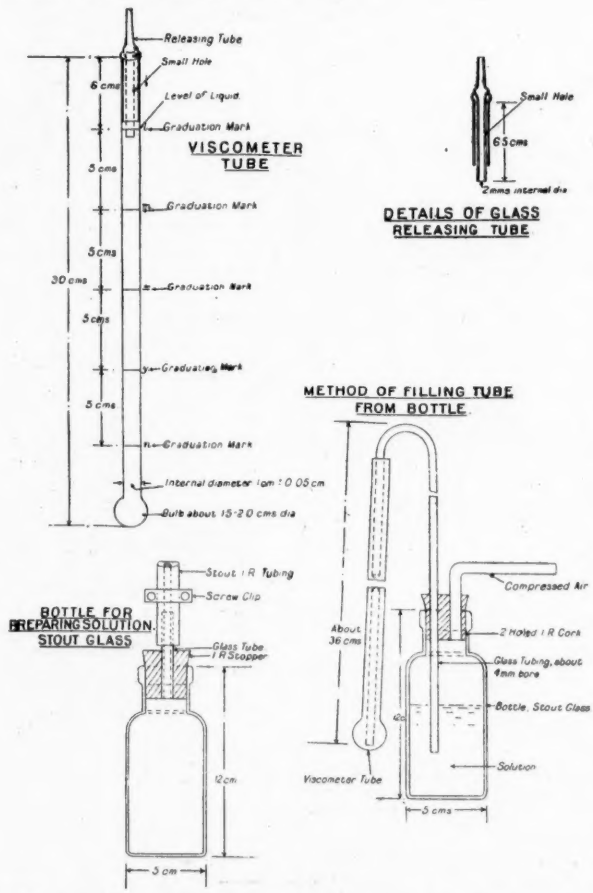

FIG. 2.—FALLING SPHERE VISCOMETER FOR CELLULOSE SOLUTIONS.

Cuprammonium solution has been found to decompose when subjected to the action of light, and hence must be stored in the dark. As solution vessel a small stout brown glass dissolving bottle is recommended. This permits of the vigorous shaking with beads necessary for correct solution; it has only one clip, thus limiting accidents and access of air; it allows large numbers of viscosities to be taken rapidly, and it is readily cleaned.

In Fig. 1 is shown an apparatus which has been constructed for making the solution of cellulose in cuprammonium hydroxide. It possesses the following advantages: (1) all air is removed from the cotton and dissolving bottle by evacuation and washing out with hydrogen; (2) the evacuation is completed before addition of the cuprammonium

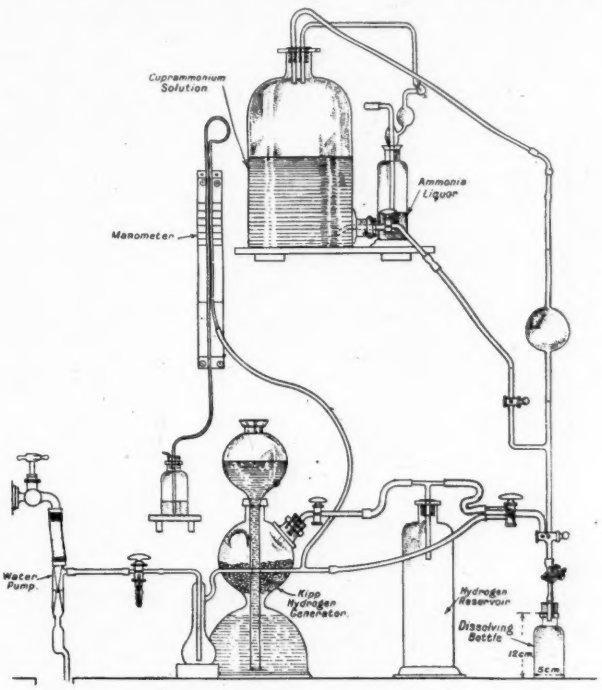

FIG. 3.—FALLING SPHERE VISCOMETER NO. 2.

solution, thus avoiding the variable loss of ammonia with its consequent effect on viscosity as experienced in the method formerly used; (3) the solution is made in an atmosphere of hydrogen at slight pressure, which prevents access of air or water into the dissolving bottle with consequent reduction in viscosity, and in addition appears to facilitate the solution of the cellulose in the cuprammonium hydroxide; (4) the cuprammonium solution is protected against loss of ammonia into the air (Table VII.). Immediately after filling and detaching the dissolving bottle, it must be vigorously shaken to distribute the fibres evenly through the solution and allow regular penetration, otherwise gelatinous lumps will form which do not dissolve.

The fall in viscosity of cellulose solutions caused by the action of light (Gibson and co-workers, *loc. cit.*) has been found to necessitate the use of dark brown or black glass bottles and darkening of the thermostat bath (Table VIII.). The dissolving bottle is entirely submerged in the thermostat bath and occasionally withdrawn for vigorous shaking by hand. The time required for complete solution varies with the viscosity of the sample, and averages two days. During the time of solution the viscosity is continually changing until it reaches a constant value.

Failure to obtain deep blue transparent solutions may be due to (*a*) impurities in the sample or in the cuprammonium solution, (*b*) a cuprammonium hydroxide solution weak in copper or ammonia, or (*c*) insufficient initial shaking. The two first give rise to an abnormally high viscosity owing to the presence of fibre sludge or dirt, whilst the last-mentioned results in the formation of gelatinous lumps, accompanied by low viscosity.

The Falling Sphere Viscometer has proved to be the most convenient apparatus for use with cellulose-cuprammonium solutions. The steel balls are of diameter guaranteed to within very narrow limits by the makers, and their densities determined at various times have been found to agree closely. In the same tube and solution different balls give times of all

which agree well within 1 per cent. It has been found essential that the viscometer tube be exactly vertical, and that the releasing tube fit centrally. Various devices to ensure these conditions are shown in Figs. 2 and 3. Under satisfactory conditions duplicates agreeing to about 5 per cent. are usually obtained, and the variations should not exceed 10 per cent.

For the determination of very low viscosities outside the range of a falling steel ball of $\frac{1}{16}$-in. diameter, a smaller diameter ball may be used, or a capillary viscometer may be introduced into the dissolving bottle. In the latter case the effect of surface air on very low viscosities has been found negligible. Capillary tubes introduced directly into the dissolving bottle give sufficiently accurate results without the somewhat complicated hydrogen apparatus described by Gibson.

Appendices I. and II.

In Appendix I. notes are published on apparatus and preparation of solutions, and Appendix II. contains the following tables :—

I.—Irregularities in Material.

Samples of sliver from different parts of same bale. (2 per cent. solutions.) The determinations were made by the modified method described in this report.

Viscosities C.G.S.

	1st portion.	2nd portion.	3rd portion.
Sample A ..	203 ; 210	223 ; 218	160 ; 164
Sample B ..	110 ; 112	80·0 ; 83·1	

II.—Effect of Disintegration.

Sliver 2 per cent. Solutions.

Treatment.	Viscosity C.G.S.
Teased by hand ..	79 ; 91 ; 83 ; 80
Disintegrated	85 ; 86 ; 85 ; 84

III.—Effect of Drying by Heat.

2 per cent. Solutions.

Material.	Time of Heating.	Temperature.	Viscosity C.G.S.
Sliver	0 hours	—	216
	2 ,,	100°	163 ; 176
Wood cellulose ..	0 ,,	—	74
	36 ,,	50°	52·5 ; 53·8
	2 ,,	100°	11·8 ; 11·8
	24 ,,	100°	4·2 ; 4·2

IV.—Effect of Cuprammonium Nitrite on Viscosity.

Sliver 2 per cent. Solutions.

Gm. copper per litre in Solution.

As cuprammonium hydroxide.	As cuprammonium nitrite.	Viscosity (C.G.S. units).
11·2	2·3	167·9 ; 165·4
11·2	1·3	161·5 ; 169·3

V.—Comparison of Results obtained with Solutions Prepared by the Old and New Methods.

Linters 2 per cent. Solutions.

Solution.	Viscosity (C.G.S. units).
Old	79 ; 84
New	82·3 ; 82·7 ; 80·2 ; 78

VI.—The Effect of Viscosity of Variations in the Composition of Cuprammonium Solution.

Sliver 2 per cent. Solutions.

A. Variation of ammonia.*

Ammonia Content.	Viscosity C.G.S.
224	95 ; 95
208	116 ; 121
203	125 ; 158
191	159 ; 163
184	243 ; 234
150	670 ; 530

B. Variation of copper.*

Copper Content.	Viscosity C.G.S.
11·7	121
10·9	130
10·4	137
9·5	150

* Other conditions as in Specification (p. 6).

VII.—Comparison of Pressure and Vacuum Method

The same sample of Linters used throughout.

2 per cent. Solutions. Pressure.	*Viscosity C.G.S.* Vacuum.
69·7	67·2
71·4	71·8
72·7	59·7
70·9	76·9
68·1	71·8

VIII.—Effect of Light on Viscosity.

2 per cent. Solutions.	*Viscosity C.G.S.* Wood cellulose.	Sliver.
Black bottles (in dark)	74·7 ; 75·2	228 ; 225
Brown bottles (in dark)	74·0 ; 70·0	—
Clear bottles (exposed to light 36 hours)	20·2 ; 21·0	—
Brown bottles (exposed to light 36 hours)	46·0 ; 47·0	184 ; 172

The Genesis of Petroleum

To the Editor of The Chemical Age.

Sir,—The problem of the genesis of petroleum, to which reference was made in your issue of August 11, is one in which I was actively interested from 25 to 30 years ago, and in a paper on the "Composition of American Petroleum" (*Trans. Chem. Soc.*, 1898, 73, 905) I pointed out that the investigations of Markownikoff, Zelinsky and others on Russian petroleum, of Lachowicz on Galician petroleum, and my own investigations of American petroleum, indicated that the hydrocarbons boiling, say, between 25° and 115° are the same in the oils from all these sources. The recent researches of Chavanne on Borneo petroleum, an oil particularly rich in naphthenes and aromatic hydrocarbons, have shown that the same hydrocarbons are present in this petroleum also. It seems most probable, therefore, that all petroleums contain the same hydrocarbon, but in varying proportions, some being much richer than others in naphthenes and aromatic hydrocarbons.

We know that by the action of heat on coal and other similar bodies distillates rich either in paraffins or aromatic hydrocarbons may be obtained according to the temperature at which the destructive distillation takes place. If, as seems probable, petroleum has been formed by the action of heat on organic remains at great depths, may not the differences in composition be due to differences in the conditions as regards temperature, pressure, and so on, under which the remains were subjected to destructive distillation ?—I am, etc.,

13, Clyde Road, Dublin. Sydney Young.
August 27.

The Twelve-Hour Shift

To the Editor of The Chemical Age.

Sir,—As chairman of the committee of the Federated American Engineering Societies responsible for the report on the twelve-hour shift in industry, I am naturally gratified to find you giving that work editorial comment in your issue of August 4. You have probably noted in the daily press that a real effort is now being made to abolish the twelve-hour day in the steel industry, and the engineers feel that they have had some part in bringing about this desirable change.—I am, etc.,

H. E. Howe.
Washington, August 18.

Validity of Chemical Patents

In a recent legal case in the U.S.A. concerning the use of diphenylguanidine as an accelerator in the rubber industry, it was held by the judges in the Circuit Appeal Court that the patent taken out by Weiss in this matter was rendered void by the previous publication of experiments concerning the use of diphenylguanidine in a chemical paper by Kratz in 1919. In addition, the chemical had been used in the manufacture of inner tubes in 1917. In effect, processes which are once made public property cannot be patented, according to the findings of the court.

Reviews

THEORETICAL AND APPLIED CHEMISTRY. By DR. WOLFGANG OSTWALD. London: Chapman and Hall, Ltd. New York: John Wiley and Sons, Inc. Pp. 266. 12s. 6d.

This is the second American edition of this work, being a translation of the eighth German edition. It is divided into five so-called lectures, but obviously, though the work may be based upon five lectures, these have been largely re-edited and added to since the time of their delivery. Dr. Ostwald gave a series of lectures in the United States and Canada during 1913 and 1914, which formed the basis for the present work. The lecturer states that the volume is "a propaganda sheet for colloidal chemistry," and it may be said that no existent volume is nearly so successful in this respect.

The first three chapters relate to the fundamental properties of colloids, methods of preparation, classification, and changes of state. The fourth is devoted to the scientific application of colloid chemistry and the last lecture to its technical applications. In the concluding chapter the author refers to the inexhaustible possibilities of the scientific and practical application of colloid chemistry as sufficient justification for its independent existence as a branch of chemistry. The work in its present state is not only a masterly exposition of the matter with which it deals, but the footnotes and references refer the reader to those papers which themselves contain a good bibliography of the subject matters which they discuss. It is quite impossible in the narrow compass of a short review even to hint at the wealth of material contained in the book which itself is in the nature of a *précis*, but it may safely be said that no ordinary chemist and few specialists in colloid chemistry could read the volume without finding reference to something new and interesting.

Technical books may be divided into two very unequal classes. A large group consists of volumes dealing with facts, theories, experiments, or processes which one may regard as works of reference. There is a very small group of books which one likes to keep handy to pick up at odd moments because the authors have the rare gift of putting their ideas forward in such a manner as to compel the reader to realise the enormous possibilities for invention and research which the subject under discussion offers, and it can certainly be said that the present work would come within this limited class.

The book is well indexed, and the only matter for regret is the somewhat pronounced neglect of reference to modern work in this country.

W. R. O.

INTRODUCTION TO THE CHEMISTRY OF PLANT PRODUCTS. Vol. II. By PAUL HAAS and T. G. HILL. London: Longmans, Green and Co. Pp. 140. 7s. 6d.

With this volume the authors have completed another edition of their well-known "Introduction." They have not merely incorporated new material into the previous 1916 edition; they have written an altogether new book. The volume now published deals with the metabolic processes of plants, and includes chapters on respiration and growth, and on the synthesis of fats, carbohydrates, and proteins.

The narrative is most pleasantly written, and has been designed to lay a foundation from which a student subsequently may raise a superstructure, rather than merely to present a digest of relevant literature. Botanico-chemical theories are now much in vogue, though of necessity somewhat ephemeral; only too often, when they are not confirmed by test-tube work, the rejoinder is, "But this is considered to demonstrate the essential difference between test-tube experiments and the activity of the living cell" (p. 47). A number of such cases are discussed by the authors; they afford most interesting reading, and although the book is intended for students, yet professors—who must needs have theories—might spend profitable time in extracting from it the dictum of Lowell: "A genuine statesman must be on his guard: if he must have beliefs, not to believe them too hard." Incidentally one may be pardoned for wondering whether such a formula as $C_{55}H_{72}O_5N_4Mg$ (p. 47) really means very much.

The authors have maintained a most judicious balance in the space devoted to the topics under consideration, and have refrained from lengthy excursions into the fascinating problems that abound, for example, in the chapter on growth. But, despite the care that has been expended on the volume—and it is remarkably free from clerical errors—a few slips have crept in: for example, on pages 5 and 6 the percentage ionisation of decinormal hydrochloric acid is variously given as 84 and 97; and, surely, the axiom that the rate of a process, conditioned as to its rapidity by a number of separate factors, is limited by the pace of the slowest factor, was known years before 1905 (p. 16).

It is always a pity when references to a "Vol. I" have to be cited in a handbook that is not meant to be a treatise: this difficulty has been reduced to a minimum by only quoting about twenty such references, and for this the authors will earn the gratitude of many a student.

D. IVOR JAMES.

A TREATISE ON CHEMISTRY. Volume II. THE METALS. By the Rt. Hon. Sir H. E. ROSCOE, F.R.S., and C. SCHORLEMMER, F.R.S. Sixth Edition. Revised by MOUAT JONES and others. London: Macmillan and Co., Ltd. Pp. 1,565. 50s.

Although the first edition was published in 1878, it can be said without hesitation that Roscoe and Schorlemmer's Chemistry in the form of the sixth edition is a thoroughly modern work, and one looks in vain for the omission of any matter which has arisen in recent years. More important still, however, is that much of the subject matter which deals with processes, principles, and facts of long standing has been recast and moulded to fit in with opinion and methods of expression adopted at the present day.

The work is too well known and established to require detailed criticism, but it should be said that although the tendency of the present day is somewhat to regard comprehensive treatises of this type as being of reduced utility owing to the fact that the science has long since outgrown the compass of a single publication, yet the number of readers who will find Roscoe and Schorlemmer of great use to them must still be very appreciable.

A works chemist will not refer to it to determine how to work the Ammonia-Soda Process, but the man who requires to know the history of it and the principles upon which it is formed, together with the why and wherefore for its development, will find all this information stated in a clear and precise manner.

Seeing that a large proportion of readers will consult the work as the first step towards becoming acquainted with a particular subject, it is to be regretted that references to the literature are comparatively few, and it is the reviewer's opinion that an extensive list of references compiled at the end of each chapter would help to make the work as comprehensive to-day as it was some decades ago, and so become considerably more valuable.

It would then form at one and the same time an admirable exposition of the salient facts and principles, and a lexicon of the whole subject.

G. N. WHITE.

THE CONSTITUTION OF MATTER. By MAX BORN, translated by E. W. BLAIR, B.Sc., A.I.C., and T. S. WHEELER, B.Sc., A.I.C. London: Methuen and Co., Ltd. Pp. 80. 6s.

This little book contains a concise semi-popular account of the work on which modern atomic theories are based. The distinctive feature of the work is the number of clear and valuable diagrams and photographs and the copious bibliography. A minimum of mathematics is included only when necessary to the reasoning, a fact which will commend the book to the general reader.

PRACTICAL BACTERIOLOGY. By DAVID ELLIS, D.Sc. London: Longmans, Green and Co. Pp. 136. 4s. 6d. net.

The author is head of the Department of Bacteriology and Botany at the Royal Technical College, Glasgow, and his book is mainly a reiteration of the excercises which are followed in his lectures. The general aim of the book is directed towards satisfying the needs of chemical students and others who desire to obtain a grounding in the general principles of bacteriology.

Notes on the Nitrogen Position in Germany

By H. E. Watts, M.B.E., B.Sc., Ph.D., F.I.C.

The author of this article acted as Technical Adviser for nearly three years to Major-General The Hon. Sir F. R. Bingham, K.C.M.G., C.B., of the Military Inter-Allied Commission of Control, Berlin, and accordingly he is in a particularly good position to furnish information on this subject.

A CONSIDERABLE amount of attention is being paid to the question of nitrogen fixation in this country at present. The report published recently by the British Cyanides Co. shows interest in this direction, and in addition to this, Brunner, Mond and Co. are, in fact, engaged in erecting a plant for the production of synthetic ammonia in the North of England. The development of the fixed nitrogen industry in Germany, therefore, should be of the greatest interest to a large number of people in this country, as it may throw a considerable amount of light on, and help to shape the course of, that industry in this country.

PRE-WAR CONSUMPTION OF FIXED NITROGEN IN GERMANY.

Before the war the annual amount of fixed nitrogen used in Germany was of the order of 240,000 tons, of which some 200,000 tons was utilised for agricultural purposes and the balance for industrial purposes. This quantity of nitrogen was supplied as follows :—

117,000 tons of nitrogen in the form of Chile saltpetre (imported).
3,000 tons of nitrogen in the form of Norwegian saltpetre (imported).
110,000 tons of nitrogen in the form of sulphate of ammonia (home production).
10,000 tons of nitrogen in the form of cyanamide and ammonia (home production).

240,000 tons

The last item of the above statement, namely, 10,000 tons, may be further subdivided as follows :—

In 1913, 1,660 tons of nitrogen were supplied in the form of ammonia by the Haber-Bosch process, and the balance was supplied in the form of cyanamide. Before the war practically no nitric acid was made by the Arc process in Germany. The above statement shows the position in Germany prior to the war with regard to fixed nitrogen.

STOCKS OF NITROGEN IN GERMANY AT THE OUTBREAK OF WAR.

When war was declared the estimated stock of nitrogen in Germany was as follows :—

6,000 tons of nitrogen in the form of Chile saltpetre.
20,000 tons of nitrogen in the form of Norwegian saltpetre and cyanamide.
20,000 tons of nitrogen in the form of sulphate of ammonia.

46,000 tons

RECEIPTS OF NITROGEN DURING THE WAR.

The nitrogen received and captured by Germany during the war was as follows :—

9,500 tons of nitrogen in the form of Norwegian saltpetre.
5,000 tons of nitrogen in the form of Chile saltpetre captured at Antwerp.

14,500 tons

PRODUCTION OF FIXED NITROGEN IN GERMANY DURING THE WAR.

420,000 tons of nitrogen in the form of sulphate of ammonia.
2,200 tons of nitrogen in the form of nitric acid by the Arc process.
190,000 tons of nitrogen in the form of cyanamide.
265,000 tons of nitrogen in the form of ammonia by the Haber-Bosch process.

877,200 tons

The total production of nitrogen in Germany during the war amounted to 880,000 tons, which amount when added to the stock at the beginning of the war and the imports during the war makes a total of 940,000 tons of nitrogen available. This total of 940,000 tons of available nitrogen was split up as follows :—426,000 tons of nitrogen was used for agricultural purposes, and the balance, 514,000 tons, used for military purposes. It will be seen that the total quantity of nitrogen available for agricultural purposes was exactly 50 per cent. of the pre-war consumption for this purpose.

Development of Nitrogen Fixation Plants during the War.

Gas Liquor.—The output of nitrogen in the form of sulphate of ammonia from gas liquor during the war showed practically no increase over the peacetime production, so that this particular industry is practically unaltered.

The Arc Process.—The economic production of nitric acid by the Arc process depends upon a cheap supply of power. Two of these plants were erected during the war and one of which was destroyed by an explosion. The amount of nitric acid produced by this process was relatively small.

Cyanamide.—The main development during the war was in the cyanamide and the Haber-Bosch plants. In order to obtain some idea of the growth of the cyanamide plants during the war it will be best to compare the plant capacities prior to the war and just at the end of the war. It is estimated that the cyanamide plant capacity in 1914 was of the order of 40,000 tons of cyanamide per annum—this is equivalent to 8,000 tons of nitrogen—whereas at the end of the war this plant capacity had been increased to 500,000 tons of cyanamide per annum (equivalent to 100,000 tons of nitrogen). Cyanamide was used for two purposes during the war: (*a*) for the production of ammonia and subsequent oxidation to nitric acid, and (*b*) for agricultural purposes. In neither case is cyanamide looked upon with favour, as when it is used as a source of ammonia for the production of nitric acid, the ammonia derived from this source contains small amounts of impurities which readily poison the contact mass in the Ostwald process. When cyanamide is used as a fertilizer it is said to possess unpleasant properties which has made it unpopular with the farmers, but it is stated that these objectionable qualities have been overcome. This fertilizer is still in use in Germany in order to supply nitrogen to the soil, but it has been noticed that the policy has been to close down some of the cyanamide factories and to stimulate the production of ammonia by the Haber-Bosch process.

The Haber-Bosch Process.—The last and most important source of nitrogen is the Haber-Bosch process, which has grown from a production capacity of some 1,600 tons of nitrogen per annum in 1913 to 150,000 tons of nitrogen per annum at the end of the war, and this has now been increased to a capacity of 300,000 tons of nitrogen per annum. The ammonia made by this process is manufactured at the factories of the Badische Anilin and Soda Fabrik at Oppau and Merseburg. The first plant was erected at Oppau and has a capacity now of 100,000 tons of nitrogen per annum. The factory at Merseburg was erected during the war and has a capacity of 200,000 tons of nitrogen per annum.

The post-war potential capacity of nitrogen in Germany may be taken as 500,000 tons of nitrogen per annum which is made up as follows :—

100,000 tons of nitrogen per annum as calcium cyanamide.
100,000 tons of nitrogen from gas liquor.
300,000 tons of nitrogen by the Haber-Bosch Process.

500,000 tons.

Fertilizers

A number of nitrogenous fertilizers are manufactured in the nitrogen fixation factories themselves, such as sulphate of ammonia, ammonium nitrate, double salts of ammonium sulphate and nitrate. Ammonium nitrate has been used for agricultural purposes in this country with varying success, and in Germany it has been appplied to the land in liquid form, but the double salts appear to be most popular, for instance,

the ammonium sulphate-nitrate has been found to give good results and is easy to distribute. This salt is stated to be not hygroscopic.

Urea

A new fertilizer and one which is considered to have a great future before it is urea. The manufacture of this compound has been carried out by the Badische Anilin and Soda Fabrik at their works at Oppau. This compound contains a high percentage of nitrogen, about 46 per cent., and combines, it is claimed, the fertilizing properties of ammonium sulphate and sodium nitrate. This concentrated form of nitrogen means a tremendous saving in freight when it is remembered that this fertilizer contains no ballast such as the sulphate radicle in sulphate of ammonia, or the sodium radicle in nitrate of soda. The following will illustrate the saving in freight which can be effected per ton of nitrogen.

One ton of nitrogen is contained in 2·14 tons of urea.

One ton of nitrogen is contained in 4·71 tons of sulphate of ammonia.

One ton of nitrogen is contained in 6·07 tons of nitrate of soda.

The saving effected per ton of nitrogen is 2·57 tons in the case of sulphate of ammonia and 3·93 tons in the case of nitrate of soda.

It has been found that this fertilizer is exceedingly successful in the cultivation of tobacco.

Intensive Cultivation

The post-war extension of the nitrogen industry is easy to understand, as with a depreciated exchange, it is necessary to keep the value of the imports as low as possible. An increased nitrogen production does this in a two-fold way, in that it reduces the imports of nitrate and, by means of intensive cultivation, it tends to reduce the importation of food. Germany, at present, is not self-supporting in respect of food; she has to import about 25 per cent. of her food consumption. These considerations are quite apart from the question of cost of production, which compares very favourably with world market prices. The area of land under cultivation in Germany prior to the war has been stated to be 35 million hectares (1 hectare = 2·471 acres), and this area absorbed at that time about 200,000 tons of nitrogen per annum which is equivalent to a distribution of 6 kilos of nitrogen per hectare. It has been found that increased crops can be obtained when the amount of nitrogenous fertilizer used is increased. In some parts of Germany the amount of nitrogen distributed per hectare has reached the figures of 11 and 28 kilos per hectare, and further experiments have been made whereby this has been increased up to 40 and 50 kilos per hectare.

Intensive cultivation has been carried out in the production of hay crops. It has been found that young grass is a better food for cattle than old grass, and experiments have been made whereby 8, 10 and 12 crops of grass have been grown in one season. In order to carry out an intensive cultivation campaign, efforts are being made to increase the annual production of nitrogen year by year, and at the same time to add increased quantities of nitrogen to the soil.

It is interesting to note that Belgium is the most progressive country in the use of nitrogen as a fertilizer, as in that country the amount of nitrogen used per hectare is nearly three times that used in Germany, whereas Germany uses about five times as much as France.

The question of nitrogen fixation has interested practically all the civilised nations of the world, and representatives of these nations have visited Germany in order to study this question. The French have made arrangements with the Badische Anilin and Soda Fabrik to erect a factory in France for the production of ammonia by the Haber-Bosch process, which is a matter of some importance.

Importance of Nitrogen Fixation in England

There is no doubt that Germany is making every effort to be self-supporting both as regards nitrogen and food. It is well known that England is not self-supporting in respect of food, owing to the small area under cultivation, and the large population which she has to feed, but it is possible to prolong the number of days during which this country could be self-supporting when the necessity arose, and apart from this there is the economic aspect of producing larger crops from the land under cultivation at present.

During the war we were dependent on our nitrate of soda coming safely from Chile—if this supply were suddenly cut off, we should no longer be in a position to produce explosives. At the present time England is dependent on outside sources for supplies of nitrogen in the form of nitrates, which means that she is not self-supporting in any sense, either in respect of the production of explosives or in respect of food. The nitrogen industry in this country plays a very important role, as, if adequate plant exists in this country in peace time, we are in a position to reduce our imports of nitrogen and of food, the latter by increasing our food productive capacity from within, whereas in time of war we are not dependent on outside sources for the raw material for our explosives, and we can increase our food production and thus liberate the corresponding amount of shipping for other purposes.

Resignation of Professor A. G. Green

Research Director and Chief Chemist to the British Dyestuff Corporation

It was announced on Monday that Professor Arthur G Green, F.R.S., had resigned his post as Director of Research and Chief Chemist to the British Dyestuffs Corporation, Ltd., on account of his dissatisfaction at the absence of technical knowledge upon the board of directors and his belief that the permanent establishment of the dyestuff industry in this country is impossible under these conditions. Professor Green has been intimately associated with the dyestuff industry both in England and in Germany for nearly 40 years, and since 1916 has held the post of Director of Research, first to Levinstein, Ltd., and later to the British Dyestuffs Corporation. His earnest desire has been to see the synthetic dyestuff industry firmly established here in a position capable of meeting all foreign competition. His many discoveries in the field of colour chemistry are well known. The dyestuffs of the primuline series, thioflavine, thiazol yellow, new Stilbene dyestuffs, his investigations upon aniline black, and quite recently his discovery of the ionamines, may be specially mentioned. He is the discoverer of a number of new coal-tar colouring matters, and is the author of many publications, including "A Systematic Survey of the Organic Colouring Matters," and "The Analysis of Dyestuffs and their Identification in Dyed and Coloured Materials."

The announcement (our Manchester correspondent writes) promises a good deal of discussion in the near future. Professor Green is still in the service of the Corporation, and he prefers, at the moment, not to amplify the bare announcement. What the position amounts to, however, is a re-opening of the controversy regarding the technical expert in relation to the management of the Corporation. Professor Green has very strong views on the question of research in the dye industry. He holds that the industry was founded upon chemical research, that it has been developed by chemical research, and that only by the continued prosecution of such research can it hope to flourish in this country. This research, moreover, Professor Green maintains, must be of a more extended and intensive description than may now be necessary in Germany, for there the industry can exist for a time by the utilisation of past discoveries, whereas the British dye industry has to be built up almost from the ground and must obtain in a few years the knowledge and manufacturing experience the German manufacturers have accumulated during half a century.

Professor Green's resignation (our correspondent adds) is a repetition of the events of May of last year, when Dr. Herbert Levinstein, late technical managing director, resigned from the board of the Corporation. In a statement to the Commercial Committee of the House of Commons, Dr. Levinstein contended that the Corporation had been directed by people of business experience but with no knowledge of science or of the dye industry. Sir William Alexander, chairman of the Corporation, later addressed the same Committee. He was, he said, not quite certain what was meant by technical direction, but it was essential that the post of administrator should be filled by an administrator. "If," he said, "you will examine those who lead the various dye companies in other countries you will find that in some cases a financier is at the head, in some cases a commercial man, and in some cases a technical man. These men do not keep their positions because of their commercial, financial, or technical knowledge, but because of their administrative skill."

Random Reflexions by a Random Reader.—(III)

The Sope-Mystery

I once saw a poor Ticinese woman kneeling in prayer before a dentist's showcase in the Hampstead Road; she doubtless mistook the teeth for the relics of some saint. I am afraid she was like a hen sitting upon a chalk egg but she seemed quite contented. Which of us, indeed, does not sit contentedly enough upon chalk eggs at times? And what would life be but for the power to do so?—*Alps and Sanctuaries.* (Samuel Butler.)

As the President of the Society of Chemical Industry told us, in his address at Cambridge, soap was a contentious subject in the early part of the seventeenth century, when a vigorous attempt appears to have been made by certain wily adventurers to "monopolize the Soping-mystery under Pretences of good to the State in the Duty of Excize."

The Sope-mystery is still with us, though we are two centuries distant from the year (1662) in which "two severalle letters patent were granted to Andrew Palmer and Roger Jones, at their wills and pleasures, to make hard sop with *Berilla* and soft soap, without the use of fire, by sundry motions and not boyling thereof and to make pot-ashes of the materials of this kingdom." In those days, about 5,000 tons sufficed to meet the public demand for the article.

Now, soap is used of all sorts and conditions of men, washing being one of the most widely spread of modern superstitions, ranking with the turning-up and creasing-of trousers among the rites which count as necessary to salvation in our present civilisation. We may, therefore, well begin with soaps and endeavour to clean up with their aid, in our attempt to elucidate the mysteries not merely of the familiar product of the soap-boyler's art but of colloids generally. There are monopolists abroad even in science who seek to impose themselves upon a credulous public and we have to defend ourselves against their specious advocacy.

At the Cambridge meeting Professor McBain briefly summarised his report in a manner which was altogether charming, with an elusive clearness calculated to carry conviction to the most obdurate of unbelievers. An audience is always carried away by a good actor; the worth of the play is only gradually discerned. At the close of the address, however, some of us, at the back of the hall, near the telephone desk, seemed to hear a whisper: "My ionic soul! My nucleus! Hamlet St. Lever speaking!" The explanation given was in terms of a particular doctrine—the gospel according to St. Arrhenius—and the ionic micelle was the star actor in the drama. Perhaps it was in an interval of somnolency and we were but dreaming; maybe we were influenced by the speaker's Bow-bellian tendency to clip his words and sorb his syllables: whatever the cause, we have to confess to the wicked thought, "May not the whole story be a sell?" Chemists have too long attempted to incubate the chalk eggs so widely sold by Arrhenius, Ostwald and Co.; it were time to end our broodiness and that we sought fresh grass for food. At least let us follow the advice given in the opening sentence of the Soap Report and subject our minds to the "severest restriction," while attempting to gain a clear, general picture of the happenings.

The first need we experience, therefore, in our desire to master the report, is some understanding as to the meaning to be attached to the word *solution*. Judging from the title, we are to concern ourselves with soap solutions: actually, the wording all goes to show that a very minor proportion of the soap is to be thought of as in solution—as uniformly distributed throughout the liquid. A liquid from which nearly the whole of a substance can be removed—or should we say sorbed?—by ultra-filtration, indeed by filtration of any kind—does not contain that substance in solution but in suspension. One great fault of the colloid school is that it has never had any clear idea of the nature of the process of dissolution or of the character of a solution.

It greatly soothes the soul to read that "Hydroxylion is a very minor constituent of ordinary soap solutions, being present only to the extent of about N/1000." Whatever this may mean, it sounds like learned and exclusive information. The contraption referred to is so fine a chemical that we believe it to be non-existent, except in the fertile imagination of the cuddlers of chalk eggs; the Board of Trade Referee would never allow it on the list, we feel sure. But the school has its Romany jargon, which many minor Borrows affect to use: we must, therefore, seek to discover what they think they mean. Our rendering of the sentence, in the vulgar English which so well served our forefathers, is—that little caustic soda is formed (by hydrolysis) when a soap is in presence of water. Whatever the meaning, the conclusion is comforting, which is drawn by the reporter "with some confidence," that the major properties of soap solutions are due to the soap itself, not to cleavage products of hydrolysis. Truth is sometimes spoken unwittingly: we, too, believe that the properties of soap solutions are due to the soap itself, not to cleavage products of any kind whatsoever.

Osmotic properties, we know, have been the subject of exact and profound study in the McBain school. The altogether noteworthy outcome of the inquiry—it is one of the utmost value—is that a strong solution (*i.e.*, suspension) of a higher soap may be said to exhibit one half the osmotic activity of an ordinary salt. How is this strange behaviour to be interpreted?

"There seems to be no alternative," says Professor McBain, "to the conclusion that half the conductivity of a soap solution is due to a negative carrier which does not exhibit osmotic activity and is, therefore, *colloidal* [our italics]: that is, the ionic micelle. A colloidal electrolyte is a salt in which one of the ions is replaced by ionic micelle: that is, highly charged and solvated colloidal particles. The undissociated, colloidal electrolyte consists of neutral micelle."

Professor McBain, seemingly, is one of those who would both eat his cake and have it: he would father an ion which only sometimes acts as an ion—one which reacts to an electric stimulus but otherwise lies low. Of course, there is but one perspective drawing as long as the viewpoint remains unchanged; still, a prospect may have more than a single viewpoint. We will not stay here to dwell upon the horridity of the word *micelle* [? singular or plural] but would merely remark that, because the Bristolians elect to be myopes, we are not necessarily all to be so classified—demnition univisuals, as Mr. Mantalini might say.

Let us then try *to see into the suds*, preserving our own and others' eyes from irritation the while: as we see it, the sight is one of a startling and varied activity.

Perhaps the most significant statement made by Professor McBain at Cambridge, a statement not in his report, was that X-ray analysis [? of soap-jelly or of curd] had shown the molecules to be ranged with their carboxylic barbs directed outwards and the hydrocarbon tails touching.

In a solution, we may picture the dissolved molecules as wandering about singly, like comets, through the liquid, "wetted" only at the head; or as sheep coming home, carrying their tails behind them—whether stationary or responsively vibrant, like those of suckling lambs, history has yet to record. Whether the hydrocarbon tail gyre or flagellate or merely remain lineate, the carboxylic tip alone being left to gimble in the wabe of the waters, the entire activity of the molecule is to be thought of as developed in this tip. The tail is the counterpart of a bladder tied to the neck of a poor swimmer. We may well liken a higher fatty acid molecule floating upon water to a light gondola propelled by a weak sculler, its sodium salt to a skiff urged forward by a small motor and screw hung over the stern, therefore more efficiently engined than the acid.

Thanks to Hardy and Langmuir and Adam, we are now able to form a clear picture of the manner in which insoluble molecules are ranged at a liquid surface. It seems to be established that those of a fatty acid stand upright, like the quills of the fretful porcupine, side by side, with only the carboxylic barb dipping into the liquid. Is this to be our picture of a soap film? Many molecules cannot be dissolved in the water—what is their prospect? Are they to be thought of as swimming about, like the Rhine maidens, gazing up at the rafted hoard above? What does the marvellous play of colour at the surface of a soap film mean—is it merely due to variations in the thickness of the film or to the ever-

changing patterns in the dance of the big molecules seeking to arrange themselves upon the floor of the black, watery film? In what way does soap contribute to the extent and permanence of this film? In the discussion at Cambridge, Professor McBain was questioned upon these points but declined to be drawn. We need a Tyndall, in these days, to preach that *some use* be made of the imagination, not merely a scientific use. We set endless questions to the poor student seeking to qualify for his miserable degree. Now that the vice of research is becoming so rampant and so paying, the time may be near when it will be desirable to set questions to be answered by researchers qualifying for grants and at various stages of their work: some examination seems called for to open their minds and force them to use them.

Naegeli, who coined the term *Micell* (diminutive of mica, a crumb), was forced to admit that it was a *ganz unbelehrte Benennung*. It is worse. To liken a colloid to a crumb is an entire mistake, if it be in any way a patterned aggregate. A crumb cannot be thought of otherwise than as a patchwork arrangement, as a model of no order in particular, a very "king of shreds and patches," thrown together without purpose of form. The soaps, it seems, are organised as *fascisti* and it is a pity that the term was not secured to their service before it was taken into political use. The molecules, apparently, keep company in bundles, after the manner of the rods in the *Fasces* borne by the Roman lictors, though in these the axe was set outwards, whilst in the soaps the carboxylic cutting edges are placed terminally; it would seem too that these edges are protected by a watery sheath. In what way the several elements are fasciated—whether fortuitously or bound together in definite numbers, in virtue of the exercise of a definite carboxylic mechanism—is one of the many problems looming in the distance upon which the ornament of imagination may well be broidered.

For our part, we are prepared for the present to dispense with a name for the supposed specific aggregates of soap molecules—until satisfied that they be real entities. Aggregate is perhaps a long word and the McBainites may desire to clip it: we can imagine the professor visiting three ladies of Bristol and asking them—"What shall I call this aggregate of mine?" And the reply of the first—"Thy agate—because at times it beareth a wonderful and beautiful pattern." And of another—"Thy gregate, because the molecule of soap liketh company." And the third—"Thy aggrate—because it hath so pleasing a feel." And I trust the Damsels would stint not saying to the professor—"Call it not thy micelle but thy agate, thy gregate, thy aggrate." Whichever term he might then choose, it would be better than the *unbelehrte Benennung* Micelle.

The really pregnant passage in the Report under notice is that in which the soaps are referred to as but members of a large class of colloidal electrolytes. They cannot, in fact, be usefully considered alone and the discussion of their behaviour and properties can only be continued with advantage from this point of view. What has been said thus far is merely preliminary; suffice it if in this excursion we have justified the poet's caution:—

There rests more faith in honest doubt
Believe me than in half the creeds.

Correction.—In the footnote to the previous article the printer's de'il has ingeniously displayed that garment which is strange alone and would be still more so "in chains," "combinations," in place of our modest "carbon atoms."

Acetylene as a Commercial Synthetic Agent

The following notes are based on an article by M. A. Guyot, published in "Chemie et Industrie" for July, 1923, under the title "Les Synthèses Industrielles au Depart de l'Acetylene." The author first deals with the chlorine addition products which are themselves valuable to a certain extent as solvents, and then passes on to consider the production of acetic acid, and synthetic alcohol and paraldehyde as commercial fuels.

A Preliminary Product

THE manufacture of tetrachlorethane from acetylene according to the reaction $C_2H_2+2Cl_2=CHCl_2.CHCl_2$, appears simple at first sight, but there is danger of an alternative decomposition occurring explosively, namely:—

$$C_2H_2+Cl_2=2C+2HCl.$$

Mounyrat in 1898 showed, however, that in the absence of oxygen the formation of tetrachlorethane proceeds quietly. Fortunately, there are several means of carrying this out practically, such as previously (1) diluting the gases with an inert gas, (2) carrying out the reaction in a chamber filled with inert material, or (3) by dissolving the gases in a common solvent such as sulphur chloride or carbon tetrachloride. In either case the use of a catalyst is essential, iron filings or turnings giving satisfactory results.

Tetrachlorethane is a good solvent of fats, aceto-cellulose, rubber, etc., but its use is restricted by its high boiling point (146° C.) and its corrosive and poisonous properties. It is, however, valuable as a starting point for further syntheses.

Trichlorethylene as a Solvent

The direct formation of trichlorethylene from acetylene is not a commercial possibility owing to numerous side reactions, but these may be entirely avoided by the quantitative conversion of tetrachlorethane into trichlorethylene by simple digestion with milk of lime or aqueous ammonia, thus:

$$CHCl_2.CHCl_2=HCl+CHCl:CCl_2.$$

Trichlorethylene is an excellent solvent of fats, rubber, resins, etc., and is neither inflammable nor toxic. It has a low boiling point (88° C.) and its latent heat (56·5) compares well with that of carbon bisulphide (87·8), and finally it is completely neutral and does not attack metals if it is carefully used. Consequently it is frequently used in the place of other solvents in the extraction of olive oil, in the dry cleaning of cloth, and so on. It must be admitted, however, that early trials of the solvent were not successful, and it achieved a reputation as bad as carbon tetrachloride. Fortunately, the conditions are now known under which it is safe to use it without risk In addition to its use as a solvent, tetrachlorethylene is of importance as the starting point for a recently established synthesis of trichloracetic acid.

An Organic Synthetic Reagent

Monochloracetic acid is one of the most important synthetic reagents in organic chemistry. The manufacture of synthetic indigo, for example, by the sodamide method, requires about a ton of monochloracetic acid for each ton of indigo. The ordinary industrial method of preparation by chlorination of acetic acid is difficult because of the production of higher chlorine derivatives which must be removed from the main product.

There has been in existence some while a whole range of patents covering processes for the formation of monochloracetic acid from dichlorvinyl ethers obtained by the action of alcoholic alkalis on trichlorethylene, but these have not achieved any commercial success. During the war, however, two French scientists, M. Simon and M. Chevanne, discovered that with the assistance of sulphuric acid, trichlorethylene could be converted to monochloracetic acid according to the equation:—

$$CHCl:CCl_2+2H_2O=CH_2Cl.COOH+2HCl.$$

Eventually the patents were acquired by the Compagnie des Produits chimiques d'Alais et de la Camargue, and developed at their works at Saint-Auban. The process consists in bringing together the trichlorethylene and the sulphuric acid at a temperature which may vary between wide limits. At low temperatures the product dissolves in the sulphuric acid and may be distilled out, or at high temperatures it may be distilled as fast as it is formed. In either case the resulting product consists of 98 per cent. of monochloracetic acid, the remaining 2 per cent. consisting of water and sulphuric acid.

The Production of Acetaldehyde

Acetaldehyde differs only from acetylene in its molecular formula by the elements of a molecule of water. $C_2H_2+H_2O=C_2H_4O$. Since, from thermochemical reasoning the addition

of a molecule of water to a molecule of acetylene should occur with the evolution of 46·2 calories, and without the addition of external energy, the question of the hydration depends on the discovery of a suitable catalyst. Sulphuric acid is immediately suggested, but Berthelot found that the condensation product crotonic aldehyde was produced. Mercury salts in the presence of sulphuric acid have been found to be satisfactory, but the process is full of difficulties, the principal being the need for continuous agitation, owing to the low solubility of acetylene in sulphuric acid, the ease with which the catalyst may be reduced to metallic mercury, and, finally, the tendency to form resinous aldehyde condensation products.

In some processes glacial acetic acid has been employed instead of dilute sulphuric acid, in which case the process is not one of hydration, but combination according to the following equation :—

$$C_2H_2 + 2CH_3COOH = CH_3-CH\begin{matrix}COO-CH_3\\COO-CH_3\end{matrix}$$

The resulting diacetate of ethylidene is then split up to acetaldehyde and acetic anhydride, thus :—

$$CH_3-CH\begin{matrix}COO-CH_3\\COO-CH_3\end{matrix} = CH_3CHO + (CH_3CO)_2O.$$

The first stage requires the use of a mercury salt as a catalyst, but owing to the solubility of acetylene in acetic acid, the need for stirring is obviated, and the process much simplified.

It has also been found possible to hydrate acetylene directly at 350°—600° C. by passing it together with steam over metallic salts or oxides, but the patents taken out have not yet been developed.

Paraldehyde as a Fuel

Acetaldehyde is usually handled in commerce in aqueous solutions, and, apart from its growing use in the manufacture of synthetic acetic acid, it has only minor uses in the manufacture of colours, perfumes and pharmaceutical products. It has two useful polymers ; the first, paraldehyde, being a stable liquid of constant boiling point (124° C.). It is readily formed from acetaldehyde with evolution of heat, on contact with sulphuric acid, hydrochloric acid or other reagents. Owing to the fact that it burns readily with a blue flame without any unpleasant odour, it has often been suggested that paraldehyde would make a useful synthetic fuel. Its heat of combustion is only a little less than that of alcohol, and it is superior when the calorific energy of equal volumes of liquid is compared. If synthetic alcohol is practicable as a product of acetylene, there seems no reason why acetaldehyde should be hydrogenated to produce alcohol (an expensive process) when it is so readily convertible to paraldehyde.

Metaldehyde, the second well-known polymer of acetaldehyde, is a solid substance in the form of white, odourless, crystals, and it has special advantages as a solid combustible product, which would have wide uses if the price were lowered by the industrial production of synthetic aldehyde.

Synthetic Acetic Acid

Acetaldehyde oxidises slowly, but spontaneously, to acetic acid. In order to increase the rate of oxidation it is not possible to employ oxygen as this results in the formation of an unstable and explosive acid—peracetic acid, $CH_3.CO_3.H$—as an intermediate product. A large number of catalysts have been proposed, of which the salts of manganese have been found to be the most satisfactory in the promotion of a regular oxidation, and several industrial processes have been based on this fact. It is, however, also possible to oxidise acetaldehyde to acetic acid in the absence of a catalyser, it being only necessary to circulate the mixed vapours in a sufficiently large column, filled with quartz grains or other inert material. It has been found that the addition of a small quantity of glacial acetic acid greatly hastens the early stages of this process. In all methods the yields are good, but not strictly quantitative, and a little CO_2 is always formed, and sometimes a trace of methyl acetate or ethyl formate is found. The production of synthetic acetic acid has increased in importance in recent years and now amounts to thousands of tons annually.

Alcohol from Acetylene and Ethylene

Although synthetic alcohol has been manufactured with success from acetylene, both in Switzerland and Germany, this was under war-time conditions, and it is doubtful if the operation of hydrogenating acetaldehyde is sufficiently remunerative in time of peace. It would seem that the development of the original Berthelot synthesis, via ethylene and ethyl sulphuric acid would be more practicable at the present time. The series of changes from acetylene thus would be :—

$$C_2H_2 \rightarrow C_2H_4 \rightarrow CH_3CH_2O.SO_3H \rightarrow CH_3CH_2OH.$$

Though this was difficult in Berthelot's time, it is only necessary to bubble acetylene through a solution of chromous sulphate (readily produced electrolytically) in order to reduce it to ethylene. Again, Messrs. Damiens and Lebeau have shown that ethylene may be absorbed by sulphuric acid in the presence of copper oxide as a catalyser, and is quantitatively converted into ethyl sulphuric acid. This process has been proposed by M. Damiens in connection with the utilisation of ethylene from coke-oven gas, and in view of the process recently proposed by M. Georges Claude for extracting hydrogen from coke-oven gas for the production of synthetic ammonia ethylene itself would be a by-product capable of paying part of the expense of the extraction.

The production of alcohol or paraldehyde as fuel is at the present time impracticable owing to the high price of acetylene, and the manufacture of acetaldehyde and acetic acid are at present the limit of the possibilities of acetylene as a synthetic agent. The method of obtaining acetylene from carbide is bound to remain expensive, and it will be necessary for some new and cheaper method to be discovered before these and other promising syntheses become commercially practicable. Many attempts have been made to obtain cheaper acetylene, and it is to be hoped that research in this direction will continue and be productive of a practicable method.

Lead and Arsenic Absorbed by Glass

During a recent prosecution at Birmingham the defence advanced the somewhat startling theory that potassium carbonate stored in glass vessels absorbed lead and arsenic from the glass. In consequence of this expression of view the City Analyst, Mr. J. F. Liverseege, conducted some experiments with the object of ascertaining its soundness. The samples of potassium carbonate he used contained 17·1 per cent., 17·6 per cent. and 18·2 per cent. of water respectively, and complied with the British Pharmacopœia requirements. They were mixed with about equal quantities of ground glass containing lead and arsenic, and kept in well-corked white glass bottles for three months. On examination he found that the soluble lead had in each case increased to about 1,400 parts per million, and that the samples contained from 70 to 100 parts of arsenic per million. This severe test proved that the solvent action of British Pharmacopœia potassium carbonate on glass containing lead and arsenic was considerable.

In a further test five grammes of potassium carbonate containing 18·2 per cent. of moisture was placed in a 4 oz. glass bottle and corked. Three months elapsed. Then the contents of the bottle were analysed. It was discovered that the soluble lead had increased from two to twenty parts per million. In another experiment the sample contained 17·1 per cent. of moisture, and the soluble lead increased from one to eight parts per million.

A feature of the two last cases was that the varying temperature of the room caused droplets of moisture to appear on the sides of the bottle, and that when the latter was shaken some of the carbonate stuck to the sides at the wet places.

Mr. Liverseege said it was probable that the variations of temperature in the places in which the substance, the subject of the prosecution, was stored would be higher than in his laboratory, and that the condensation on the upper part of the bottle might be sufficient, when some of the contents were shaken out for sale, to make a strongly alkaline solution which would have a solvent action on the glass. He added : " These experiments show that if potassium carbonate be kept in bottles which contain arsenic and lead, there is a risk of the drug being seriously contaminated and that it is desirable that this drug should be kept from contact with such glass."

The Problem of Unemployment Among Chemists

Causes and Suggested Remedies

THE problem of unemployment among chemists is again attracting attention, and extracts from recent statements in which the causes and remedies are discussed are published below.

Mr. W. Rhys-Davies

Mr. W. Rhys-Davies, writing from Harrogate, states :—

I would like to draw the attention of parents, now we have drawn to the close of another school year, to the fact that once more the problem is raised of what to do with clever boys. The profession of chemistry has been repeatedly discussed in the technical Press, and now the question arises as to whether this comparatively new profession is not already over-crowded. The high percentage of unemployment among chemists at the present time does, indeed, warrant serious consideration, the more especially as so large a proportion of the unemployment in the profession is to be found among young graduates of the last two years, who have been unable to find appointments since qualifying.

It is true that the majority of the recently qualified chemists have been absorbed into the profession, and that less than thirty per cent. of last year's graduates or newly-elected Associates of the Institute of Chemistry have failed to secure appointments, but none the less it is apparent that the supply of chemists at present exceeds the demand. This situation must not be entirely attributed to the prevailing depression in industry. A large share of responsibility lies upon the shoulders of those who, during the war and the period immediately following the armistice, painted the future development of chemical industry in this country, with its consequent demand for thousands of fresh chemists, in such glowing colours.

It does not seem too much to expect of reputed leaders in Government service, or in industry, that they should have looked sufficiently far ahead to guard themselves from utterances leading hundreds of students to follow an expensive course of study which, at its conclusion, left them with no opportunity of pursuing their chosen career. The various technical institutions and Universities are again advertising their courses for the coming session. There is no legal responsibility on these institutions to guarantee employment after qualification, but I hold that there is always a moral responsibility on their part in advising suitable careers.

It is easy to be wise after an event, and there is reason to believe that with the falling off in the number in the Universities and Colleges last autumn, the number of qualified chemists turned out each year will be more proportioned to the law of supply and demand. The absorption of the mass of young graduates at present unemployed proceeds most slowly, and may possibly react with advantage to the profession, in that it tends to secure a wider leavening of industry with only the very best men trained in scientific methods.

The leaders of the profession, however, must see that such a situation is never allowed to develop in the future. Full and accurate information as to the prospect in this profession must always be available, not only for the teaching authorities, but also for the teachers and parents of pupils in the secondary schools.

British Association of Chemists

The British Association of Chemists, in its latest bulletin, deals editorially with the subject in terms virtually identical with those used by Mr. Rhys-Davies, but adds the following note :

The problem cannot be left where it is. It involves the whole question of entry into the profession, and is bound up with the larger issue of the legal re-definition of the term "chemist." Entry to the profession cannot be fully regularised until that re-definition has been obtained, but in the meantime chemists may do much to put their house in order. The fundamental qualification for entry to the profession to-day is generally recognised to be a thoroughly sound training in the principles and methods of chemistry. On such a foundation specialisation can readily be based when the young chemist enters a particular branch of industry. A situation like the present throws into bolder relief the importance of such a grounding in the principles of the science. With it the chemist is able to turn easily at need from one branch of industry to another. Without it he is tied down to one relatively narrow field of work with consequent greater risk of unemployment, to the detriment both of himself and of his profession. It is the great weakness of the evening class system of training that its relatively narrow syllabus, however admirably it may qualify a man as chemist in one particular industry, leaves him peculiarly at the mercy of such a depression as we have witnessed during the last two years. For lack of a broad training in general principles he is unable readily to turn to another branch of industry, and is in consequence menaced with a prolonged period of unemployment. For this reason alone the partially qualified man is as real a danger to the profession as the unqualified or incompetent, and no more pressing duty lies before the chemists of to-day than that of ensuring that all those entering the profession shall have received a training on the soundest and broadest lines.

Mr. R. B. Pilcher

In *Chemistry as a Career*, a synopsis of lectures given by the Registrar before College Chemical Societies during 1921–23, just published by the Institute of Chemistry, Mr. R. B. Pilcher deals very fully with the subject. Summarising the chief branches of employment as (1) private practice, (2) industry, (3) governmental or municipal, (4) educational, (5) a combination of two or more of the above, and (6) other employment in which chemical knowledge is useful, he discusses each in turn :

Private Practice.—In private practice the vacancies are not so numerous as in industry. They occur in the laboratories of consultants, public analysts, chemical engineers, metallurgists, and other specialists. Experience gained with well-known practitioners is often of great value, not infrequently providing those who are able to take advantage of it with stepping stones to positions of importance in industries relative to the practice. Thus, the public analyst's assistant becomes a chemist in a food or drug factory ; the assistant of a metallurgist proceeds to metal works or mines, and so forth.

Industry.—The appointments in industry are necessarily various. In a large concern the start may be made in testing work—the examination of raw material, intermediate and finished products, besides fuel, water, paints, lubricants, and other substances and materials required in the ordinary maintenance of the works. Chemists are also required for research, for plant control, and for management. Many industrial concerns are now fully alive to the importance of research work on fundamental principles. Such concerns not only contribute to organised research associations, but make allowance for a certain amount of what might be termed academic work in their own laboratories. The main object of research in industry, however, is economic and directed to such problems as the improvement of quality, the increase of yield, the reduction of cost, the utilisation of waste, or introduction of new products. Plant control requires chemists who have the ability to direct processes, with the attendant difficulty of keeping on good terms with operatives who take part in the large scale operations. Besides being thoroughly acquainted with the plant and the principles of the processes they must be ready to take off their coats, and be ready for emergencies, having due regard to the dangers (if any) of the work. Ever alive to the fact that business is business, and as such is run for the benefit of the employees as well as for the employers, they should not neglect opportunities of making useful suggestions for economical development which may be adopted forthwith, or referred to the research department for investigation. Employers are much more enlightened now than they were formerly as to the value of chemists and chemical research. The management of many industrial concerns is surely, though in some cases slowly, passing to trained chemists. That movement tends to increase the demand for scientific assistants of the highest order, and such assistants are now selected with greater discrimination than they were in the past. . . . If chemists are to take a more

prominent part in industry they must be men of affairs as well as chemists. If they are to replace what might be termed " rule of thumb " or " practical " men, it will be necessary for them to acquire something of the good and useful qualities of the latter. This is very much a question of personality, but it may be suggested that more chemical students should be encouraged to take training in the principles of engineering, and some at least to acquire experience in commerce.

Governmental and Municipal Work.—There are appointments for chemists in the Government Laboratory, and in laboratories under the War Office, Admiralty, and other Departments of State, besides municipal laboratories, public health laboratories and the like. Some of these now—in contrast to pre-war days—afford a moderately good prospect, and in any case provide " jumping-off ground " to better positions.

Teaching.—In teaching, the appointments are numerous and the conditions have lately been improved, though the appointments carrying salaries of more than £600 a year are comparatively few. A real enthusiasm for the work is essential and the teacher, at any rate in a university or technical college, should have ability at least equal in standard to that required of chemists in private practice and in industries. A chemist who wishes to teach, and yet to be regarded as a chemist should not remain content to teach elementary science, but should strive, at all costs, to do some good research work, or he will soon cease to merit his qualification.

General.—Among other careers for chemists, not a few have qualified for the bar, several are successful as patent agents, and others have become technical journalists.

For a chemist, newly qualified and without experience, but with a good college record, a salary of £300 is frequently obtained. Some have been more fortunate and some less; but the aim of the beginner should be to secure a chance of proving his worth, especially in any concern which is likely to afford a prospect of advancement. After all, whatever bargain is made at the beginning, the main thing is to get to work. Every individual must take what steps he can to get work, and, when the outlook in chemistry is in doubt and openings are few, he should try for any position affording useful experience in which he can " mark time " until conditions improve and he is able to find an opening in his own chosen career. A chance to gain an insight into business should form a valuable addition to the equipment of a chemist, who, in such circumstances, need not neglect his chemistry in his spare time. When the time arrives to make a start in professional life, the chemist needs to have careful regard to the value of time, the value of apparatus and material, and costs generally. The amount of work expected of him in a day will greatly exceed what he has ordinarily done in the College, and conditions may not be so congenial.

There is a tendency in all professions towards overcrowding, but there is always room for the best in every profession. Some may have means or influence: the most valuable influence which a chemist can possess is the good opinion of those with whom he has actually worked, and the testimony of those who can speak of his work from first-hand knowledge; yet influence is of little avail without true worth: it may help him for a time, but in the end he must make his own way.

Cobalt Production in Canada

THE Dominion Bureau of Statistics states that the major portion of the world's supply of cobalt for almost two decades has been derived from the silver-cobalt-nickel arsenides of the Cobalt district. During 1922 three smelters in Ontario treating ores and residues from this district marketed cobalt oxide, metallic cobalt, cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparated oxide and stellite (an alloy of cobalt used for high-speed tool metal). The cobalt residues from the cyanide process were mainly treated in Canada during 1922, although some of these as well as smelter residues amounting in all to 518 tons containing 173,211 lb. of cobalt were shipped abroad for treatment. The cobalt production of Canada in 1922 was 569,960 lb., which at $3.25 per pound would be worth $1,852,370. These figures were obtained as the total of the metal cobalt contained in smelter products made in 1922 and cobalt in residues exported for treatment, valued at $3.25, which was the average New York quotation for cobalt during the year.

Minerals Separation, Ltd.

New Coal-briquetting and Copper Processes

IN the course of his address at the annual meeting of Minerals Separation, Ltd., held in London on Tuesday, Mr. Francis L. Gibbs, the chairman, said that since the last general meeting the company's interests had been greatly extended, but not so as to interfere with pushing forward the development of either their new copper process or of any of the new coal-cleaning and briquetting systems. On the contrary, those new processes had provided the board with opportunities for the growth of the company's interests.

Cleaning and Briquetting of Coal

There was now little doubt that the department of their business which would prove to be the first to become income-bearing on a considerable scale would be that which dealt with the cleaning and briquetting of coal. It was the board's intention last year to proceed with the construction of a large briquetting works on the site which the Powell Duffryn Steam Coal Company and the Minerals Separation Company had acquired at Newport, but in view of the fact that La Compagnie Française des Mines Powell Duffryn had decided to erect a large plant at Nantes, in France, it was considered wise to await the completion and running of that plant before embarking on any large expenditure in Wales for the erection of their plant at Newport. The experience to be gained from the running of the Nantes plant was considered to outweigh in value the disadvantage of the delay in the erection of their Welsh plant.

The working of the Nantes plant had proved that the company could with confidence proceed actively on other installations. An outstanding point of great interest which had been established at Nantes was the truly marvellous calorific power of their briquettes as compared to others. The heat-producing quality was immense, and had caused the utmost astonishment to those who had been so far accustomed to burn the best brands of briquettes at present on the market. A tug drawing a set of barges up from Rouen to Paris used briquettes made by their system, on which journey, by using their fuel, 30 per cent. saving was effected, and it was found that the freedom from ash of their fuel rendered the continual raking out of the fires quite unnecessary. There was no question that their patent fuel would not only be much cheaper to produce, but much better in quality, so that the inference was that the industry would tend to increase and the profits be larger to those engaged in it. They had lately, in combination with one of the leading colliery owners in this country, taken an option over a works in South Wales for the purpose of manufacturing what would correspond to anthracite nuts. And there was little doubt but that they would exercise that option before the end of this year. Several installations of their methods for cleaning coal for cooking purposes were at present going on in Spain, France, Belgium, and Germany, in addition to various parts of England.

Ore Reduction Processes

In regard to the ore reduction processes for the treatment of oxidised silicate and carbonate copper ores the Chairman said he had also to report a decided advance. A plant was being erected in Australia, as was another in the United States, and a small plant had been erected by the Bwana M'Kubwa Copper Mining Company in Northern Rhodesia, the results of which would be available almost immediately. Interest was also being displayed in their processes by the mining industry in Australia, and their business in South America showed a decided tendency to improve. By the success of this new copper process a new factor of great importance in the world would arise in the shape of a large increase within the British Empire of copper production, which could not fail in time to change the present low place in which the Empire stood among copper producers to a very high place. At present only about 8 per cent. of the copper output of the world was produced in the British Empire.

Selective Flotation of Chalcopyrite

RESULTS of a series of grinding and flotation tests made at the Southwest experiment station of the U.S.A. Bureau of Mines indicate that good recoveries and high-grade concentrates can be obtained by the use of the selective flotation process on chalcopyrite ores.

The Progress of Pulverised Fuel

As is well known, pulverised fuel for steam generation and general furnace work has made remarkable progress in the last two or three years in the United States, and the report that has just been made public by Mr. S. W. Baynes, Chief Engineer of the St. Pancras Electricity Station, shows that at last British power station engineers are giving serious attention to this important and almost revolutionary development in the science of steam generation. The Electricity Committee of the St. Pancras Borough Council have recommended, in view of the great extensions contemplated at the King's Road Power Station, St. Pancras, that the chairman of the Electricity Committee (Alderman J. H. Mitchell, J.P.) and Mr. Baynes be empowered to visit the United States and inspect a number of the largest American power stations with a view to the possible adoption of pulverised fuel.

Mr. Baynes in his report mentions the rapid growth of the use of pulverised fuel in American power stations, but it may be pointed out that pulverised fuel, a very old idea first used in the cement industry about 1890, was not a success until the perfection of the "Lopulco" system in 1920 with the water screen or arrangement of keeping the ash cool in the furnace so as to prevent "slagging," the use of hollow air-cooled furnace walls, the supply of preheated air to the burners, and the zone system in the combustion chamber, which also has a very large volume, the boiler being a considerable height from the ground.

From a chemical point of view the great advantage of this method of firing is the intimate mixture of the fuel and the air so that combustion is carried out with only about 20 per cent. excess air over the theoretical, instead of about 75–100 per cent. as by ordinary methods, and 35–40 per cent. even with the latest types of mechanical stoker operating on large water tube boilers. The consequence is a smokeless combustion with about 17 per cent. CO_2 and intense radiant heat with entire absence of CO.

The first large power station, and the real pioneer pulverised fuel plant in the world, fitted with "Lopulco" pulverised fuel, was the new Lakeside station of the Milwaukee Electric Railway and Light Co. on Lake Michigan. This was planned in 1915 for 200,000 kW, following on the very successful results obtained with "Lopulco" pulverised fuel on the smaller Oneida Street station, Michigan, belonging to the same company. The scheme was held up somewhat by the war, but 40,000 kW was started up in December, 1920, consisting of eight "Edgemoor" water tube boilers of 13,080 sq. ft. heating surface (six running at a time) at 300 lb. pressure, and the results obtained have been astonishing. The plant is running continuously all the year round at 85–86 per cent. efficiency with a total expenditure of auxiliary power of 1.75 per cent. of the steam production and with less labour and wear and tear, depreciation, and repair costs than mechanical stoking. Since the advent of this pioneer plant the development of pulverised fuel, in less than three years, has been extraordinary.

At the present time over 30 installations are either working or in progress of erection, including some of the largest and most famous power plants in the world, such as the River Rouge plant of the Ford Motor Co. at Detroit, the Ford plant in Canada, the Cahokia station for St. Louis, the Cleveland Electricity Co., which will have the largest boilers in the world, and the Trenton Channel Station of the Detroit Edison Co. These installations dwarf anything contemplated in Great Britain, and with regard to the general idea over here that pulverised fuel is a matter for experiment, it may be pointed out that the Lakeside station alone has probably burnt something like 750,000 tons of coal in the pulverised condition and very soon the equivalent of over 1,000,000 H.P. will be in operation in America using this method of firing. At the same time still further improvements have been made in the "Lopulco" design during the last 12 months, the chief of which is a new vertical dryer for the coal, using only the hot chimney gases, so that the total auxiliary power complete is actually now less than 1 per cent. of the steam generated, whilst the efficiency guarantee for the huge Calokia Station at St. Louis is over 86 per cent. efficiency and the figure expected is 88¼ per cent. As is well known, the very large plant now being erected at the Vitry Station, Paris, will be the first modern pulverised fuel installation in Europe, and is expected to be ready by the end of this year.

Lead Azide in Explosives

Lead azide, nitride, or hydronitride has been used for a comparatively short time as an initiating agent in the manufacture of explosives, and has replaced mercury fulminate to some extent, according to Messrs. C. A. Taylor and William H. Rinkenbach, explosives chemists of the Department of the Interior, who have made a study of the subject at the Pittsburgh experiment station of the U.S.A. Bureau of Mines. Many accidents in manufacture have, however, been attributed to its use. Lead azide is prepared by precipitation in a solution of sodium azide by a solution of either lead nitrate or lead acetate. The precipitate is caught on a filter, washed with water, and dried at a temperature not to exceed 95° C. In the manufacture of this compound care must be taken that large crystals are not obtained, as these are much more sensitive than small uniform crystals. Lead azide resembles lead chloride in appearance. It is practically insoluble in cold water, and only 0·05 per cent. soluble in hot water. It may be kept under water at ordinary temperatures for years without its explosive properties being impaired, but after continued boiling with water non-explosive lead compounds are formed. It is soluble in an excess of lead acetate. Lead azide is comparatively safe in a state of fine division, but its large crystals are extremely dangerous. It does not become dead pressed like mercury fulminate, and its brisance increases with the pressure used. It contains more nitrogen than fulminate, and is a better initiator, though it is less sensitive to blows and percussion.

Phosphates Deficiency in Basic Slag

About 50,000 tons of basic slag have within a specified period been sold, through agents, to Devonshire farmers, and as some doubt as to the quality of the material arose samples were submitted to the county analyst, who found a deficiency in phosphates. The Council took action, with the result that the firms supplying the slag consented to a reduction of ten shillings per ton on the original contract price. From the report of the county analyst—confirmed by the Government analyst—the purchasers were entitled to a rebate of 18s. per ton. But the situation was complicated owing to the fact that the material had passed through the hands of several dealers, and finally was sold in small lots. The Ministry of Agriculture, it is stated, are loath to take proceedings under the Merchandise Marks Act, and the Council have written to the Department expressing extreme dissatisfaction with their decision.

The Release of Seized Dyestuffs

Seven tons of dyestuffs and chemical products seized by the French and Belgian authorities at German factories early in the year were stored at Kehl. The necessity of making an inventory and also the precautions which had to be taken in order not to affect adversely the French dye industry, prevented for some time the liquidation of these stocks. Now, however, it is announced that the Union of Producers and Consumers for the Development of Dyestuffs in France has informed its members that dyestuffs thus seized, which are intended for export, are now placed on sale. A portion of the total quantity seized, composed of dyes which French producers do not manufacture, has been reserved for French manufacturers, whose orders to Germany have not been complied with since January 11.

Chemical Societies in China

In China there are two chemical associations where papers on technical and business matters are discussed and professional and commercial interests meet. These are the Shanghai Chemical Society, Shanghai, and the China Society of Chemical Industry, Peking. Periodicals which give more or less attention to chemicals include *The Journal and Proceedings of the China Society of Chemical Industry*, quarterly (Chinese), industrial chemistry, and *The China Journal of Science and Arts*, bi-monthly (English), which has a supplement devoted to chemical matters.

From Week to Week

PROFESSOR J. W. HINCHLEY, Professor of Chemical Engineering at the Imperial College of Science and Technology, is spending a holiday on the Continent.

THE BRITISH CHAMBER OF COMMERCE in Brazil reports that the principal imports during 1922 included 319,550 tons of cement, 8,288 tons of potash, and 4,671 tons of sulphur.

EXPORTS OF CHEMICAL PRODUCTS from Canada during the year ended June 30 amounted to $15,167,316 as compared with the total for the preceding twelve months of $9,540,024.

"THE USE of Non-Ferrous Metals in Engineering" will be dealt with by Sir Henry Fowler at the autumn meeting of the Institute of Metals, in Manchester, September 10 to 13.

MR. D. BAKER, manager of the Broken Hill Proprietary Co.'s iron and steel works, is retiring, but will continue to serve the company in a consulting capacity. He will be succeeded by Mr. L. Bradford.

DR. BANTING, as the result of his discovery of Insulin, has attained the distinction of being the most heavily insured individual in the world. The insurance policies taken out on his life amount to about £1,000,000.

AN EFFORT is being made to place hashish, distilled from the Indian hemp plant, within the provisions of the Dangerous Drugs Act. At present there is no Customs regulation to restrict its importation into Great Britain.

THE STEAMER *Trewithen* arrived at Swansea on Tuesday with the largest single cargo of ore ever brought to the port, namely, 10,000 tons of Australian zinc concentrate from Port Pirrie, for local spelter manufacturers.

THE AUTUMN MEETING of the Iron and Steel Institute will be held in Milan on September 17 and 18. Among the subjects down for discussion are "The Iron and Steel Industry of Italy," and "The Iron Ore Mines of Nurra (Sardinia)."

MR. HENRY FOLLAND, managing director of Grovesend Steel and Tinplate Company, Swansea, has given £3,000 to the Metallurgical Department of Swansea University College to provide three scholarships of £50 a year each.

THE BRITISH RED CROSS SOCIETY, which is organising the appeal for the British Empire Cancer Campaign (which aims at raising £1,000,000 for cancer research), is appealing for voluntary workers who will assist in the collection of funds.

MR. J. S. NEGRU, formerly managing editor of *Chemical and Metallurgical Engineering*, New York, whose recent articles on European conditions attracted considerable notice, is now editor of *La Revue Universelle des Mines*, at Liège, Belgium.

DR. ARTHUR A. NOYES, director of the Gates Chemical Laboratory of the California Institute of Technology, has been elected an Honorary Fellow of the Royal Society of Edinburgh. Of the 57 Honorary Fellows of the Society only seven are Americans.

MR. S. N. BROWN, F.C.S., consulting chemist, of the Broughton Analytical Laboratories, 7, Chapel Walks, Cross Street, Manchester, has recently formed a partnership with Mr. James Booth, A.M.I.Chem.E., F.C.S., who will act as consulting chemical engineer to the above laboratories.

AT THE LONDON chemical head-quarters of an important American concern news was received from Berlin a few days ago to the effect that British and American interests were buying up the dyestuff shares of the Badische Company. Inquiries failed to disclose any foundation for the rumour.

A REPORT of the Board of the British Empire Exhibition states that up to the end of July the amount of space allotted to prospective exhibitors in the Palace of Engineering was 16,817 square feet, and in the Palace of Industry 7,250 square feet. A balance of 45,361 square feet remained for appropriation.

AT A MEETING of the Board of Governors of the American Synthetic Organic Chemical Manufacturers' Association held last month, the Board recommended to the individual members of the Association the adoption of the uniform contract for the chemical industry, as submitted by the Joint Committee on Uniform Sales Contract for Chemicals.

THE CANADIAN PARLIAMENT have appointed a Commission to inquire into the forest resources of the Dominion, with particular regard to the extent of the pulpwood in each province. The Commissoners are also to report on the quantity of pulpwood lands privately owned or leased to citizens of Canada or other countries, and on the advisability of prohibition or restriction of export.

THE BULLETIN of the British Association of Chemists records the work of that organisation during the past three months. It states that there were at the end of July 652 members on the unemployment benefit fund, and that while subscriptions received during the year amounted to £1,399, £338 had been paid out. The legal re-definition of the term "chemist" had been brought to the front, and an effort is to be made to educate public opinion as to the correct significance of the terms "chemist" and "pharmacist." The annual meeting of the association is to be held at Birmingham on October 27.

THE FEDERAL CABINET of Australia have refused to place an embargo on the importations of carbide, made at the request of the Tasmanian carbide industry. It is stated that the quotation for Australian carbide is £15 8s. per ton, while that for the Tasmanian article is £32. The local industry was closed down for some time, but activities have been resumed on the assurance of the Prime Minister (Mr. Bruce) that in any instances of the importation of carbide into Australia at prices lower than the rates for Australian consumption, the provisions of the Australian Industries Preservation Act would be enforced.

MRS. HERTHA AYRTON, widow of Professor W. E. Ayrton, who died on Sunday at North Lancing, was well-known as a scientific investigator. She was nominated for the Fellowship of the Royal Society in 1902, but on counsel's opinion the Council decided that it had no power to elect a woman. The Hughes medal, however, was awarded her by the Royal Society four years later. In addition to co-operating with her husband she was herself the author of several scientific inventions, including the "Ayrton Flapper," a fan for dispersing poison gas in the trenches and dug-outs, of which over 100,000 were used during the war.

SIR FREDERICK BECKER is now in Canada in connection with pulp and paper manufacture developments, one of which, it is stated, may result in the doubling of the output of the Bay Sulphite Company's plant at Port Alfred, Quebec. Railway extensions that would make the enormous pulp wood limits of the Bay Sulphite Co. and the Chicoutimi Pulp Co. well accessible are likely soon to be put in hand. The probable construction of a newsprint mill beside one of the groundwood pulp mills controlled by the Saguenay Pulp and Power Co. is mentioned. At present the whole of the groundwood pulp, about 500 tons a day, is exported.

THE BRITISH CHEMICAL AND DYESTUFFS TRADERS' ASSOCIATION have called H.M. Customs' attention to the fact that though the Official Referee's award removing formaldehyde from the list of dutiable articles was dated August 10, it did not take effect until August 20, and that duty has been charged on consignments arriving in this country between the two dates. With reference to the Association's protest against the German law providing that foreigners pleading in German courts may be ordered to give security for costs, the Board of Trade point out that the provision is contained in paragraph 110 of the Civil Service Ordinance, that this ordinance was in force long before the War, and that they cannot regard such a provision as altogether unreasonable.

NEXT MONTH will witness the commencement of the work of the Ramsay Memorial Department of Chemical Engineering at University College, Gower Street, London. This department has been instituted with the object of enabling young graduates in chemistry and engineering who have already obtained a good training in the fundamental sciences of chemistry, physics, and mathematics to direct their studies and investigations towards the application of the principles of physical chemistry to the scientific design and operation of the apparatus and processes of chemical industry in general. As already announced in THE CHEMICAL AGE, Mr. E. C. Williams, M.Sc., of the University of Manchester, has been appointed professor in charge of the department. The University College Committee will shortly appoint an assistant lecturer, who must have had an engineering training. The commencing salary, which will depend on the experience of the applicant appointed, will be £350 or £400 a year.

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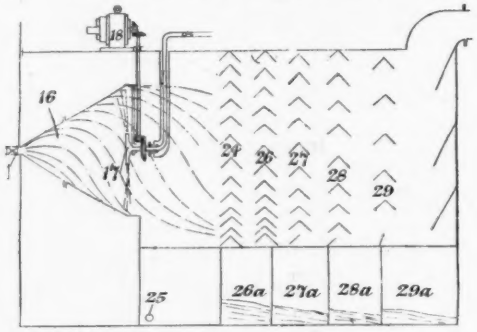
Patent Literature

Abstracts of Complete Specifications

200,998. Concentration or Drying of Solutions, Suspensions, and Colloidal Dispersions, Process and Apparatus for. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, London, S.W.1. From H. Plauson, 26, Jarrestrasse, Hamburg, Germany. Application date, February 2, 1922.

Liquids are evaporated by means of air or other gas which is moving at a high velocity, *i.e.*, 50 metres per second or more, relatively to the particles of the liquid. The high velocity of the gas is obtained by allowing it to expand from 8–12 atmospheres through nozzles similar to those used in steam turbines, and the gas is allowed to act on the solution which has been dispersed so as to have a very large surface area. The liquid may be dispersed by means of an atomiser, or in the form of a thin film, or it may be allowed to trickle over



200,998

solid material. It is found that the consumption of heat necessary for evaporation in this process is 30–60 per cent. less than with the usual evaporation process. The process is applicable to the evaporation of salt solutions, and the dehydration of colloidal dispersions of kaolin, mineral colours, coal, peat, graphite, etc. Compressed air or super-heated steam may be used, or an inert gas if the substance is sensitive to air or oxygen. For a hygroscopic substance a higher temperature may be employed, or a dehydrating substance may be added to the air. As an example, calcium chloride solution is evaporated at 30°–40° C., or 0·1–0·5 per cent. of hydrochloric acid gas may be added to the compressed air at a temperature of 20°–30° C.

In one example of the apparatus used, the air or gas is expanded in a nozzle 16 and also given a rotary movement, while the liquid is spread into a thin sheet by means of a rotary device 17 driven through gearing by a motor 18. The gas is thus projected at high velocity through the film of liquid, and then passes over baffles 24, 26, 27, 28, 29, and the liquid or solid material is collected in separtate containers 25, 26a, 27a, 28a, 29a. Other forms of apparatus are also described in which the liquid is distributed over packing material in a tower. It has been found that the evaporation depends greatly on the presence or absence of small quantities or ionisers; *e.g.*, in evaporating sugar solutions, an addition to 1–2 per cent. of carbon dioxide or 0·5–1 per cent. of alcohol has a strong deionising effect, and evaporation is more rapid. The opposite effect is produced by the presence of small quantities of acids. The process is particularly adapted for the drying of colloidal solutions which are liable to decompose if the temperature is raised.

201,214. Chlorinating Liquids, Method of and Means for. J. W. van Meter, 573, Market Street, San Francisco, Cal., U.S.A. Application date, April 19, 1922.

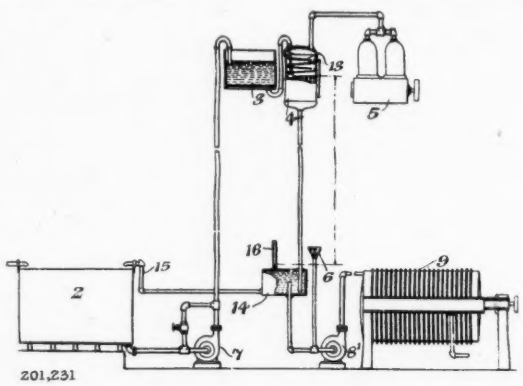
The object is to facilitate the chlorination of liquids for cleaning, bleaching, dyeing, or sterilising purposes. An apparatus is described in which the chlorine is generated, stored under pressure, and passed at a regulated rate through a spirally groved nozzle into the liquid to be chlorinated. By this means the mixture of liquid and gas is agitated and given a whirling movement. The chlorine may be mixed with steam at a relatively high temperature so that the liquid is sterilised.

201,223. Mineral Oils, Purification of. A. E. Dunstan, Meadhurst, Cadbury Road, Sunbury-on-Thames. Application date, April 22, 1922.

The object is to obtain a pure distillate and residue of mineral oils, particularly naphtha. The naphtha is treated with chlorine in the presence of water, *e.g.*, in the form of chlorine water or an aqueous solution of hypochlorous acid, whereby the sulphur content is removed from the naphtha. The purified naphtha is then distilled, yielding a gasoline distillate and a kerosine residue free from sulphur compounds. The kerosine residue is then filtered through bauxite or floridin to remove any chlorinated products and other residual impurities. In an example, naphtha containing 0·146 per cent. of sulphur was treated with 0·426 per cent. of chlorine as chlorine water. The naphtha was then washed with weak caustic alkali and distilled, yielding a benzene distillate of specific gravity 0·720 having a sulphur content of 0·01 per cent. and a chlorine content of 0·01 per cent. The residue was filtered through bauxite (or silica gel) yielding a product having a sulphur content of 0·04 per cent.

201,231. Precipitating Metals from Solutions, Process of. E. C. R. Marks, London. From the Merrill Co., 121, Second Street, San Francisco, Cal., U.S.A. Application date, April 25, 1922.

In the precipitation of metals from solutions it is found that the dissolved air and other gases are liable to cause a reoxidation of the precipitate and reduce the efficiency of the process. In the present invention the dissolved gases are eliminated mechanically, or alternatively a reducing agent such as sodium sulphide or hydrogen may be used. The solution is supplied from a tank 2 by a pump 7 to a feed tank 3, and then passes through an S-shaped pipe to a chamber 4 in which a vacuum is maintained by a pump 5. A constant level is maintained in the chamber 4, and the incoming solution passes over baffle plates 13 to facilitate the elimination of the



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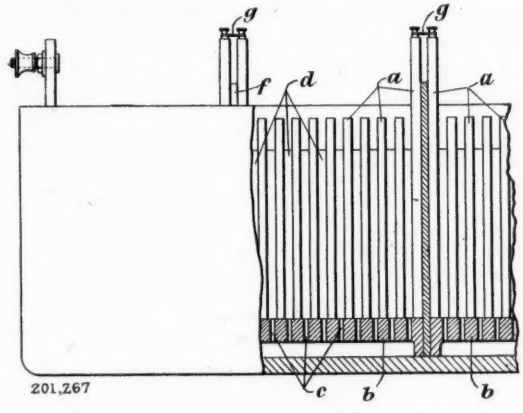
dissolved gases. The solution then passes through a barometric tube to a tank 14, having an overflow 15 leading to the tank 2. The apparatus must be arranged so that the height X between the level of the liquid in the chamber 4 and in the standpipe 16 is greater than the degree of vacuum in the chamber 4. The solution is withdrawn by the pump 8, and the precipitant, such as pulverised zinc, is added from a hopper 6. Precipitation occurs in the pipe leading to the filter press 9 and in the press itself. A modified construction of apparatus is described in which the precipitation takes place at the same time that the solution is subjected to the vacuum, instead of subsequently. The process is applicable to the precipitation of precious metals from cyanide solutions and to other reactions such as the precipitation of copper from copper sulphate solution by means of iron.

201,267. Bi-Polar Electrode Electrolysers. Mather and Platt, Ltd., S. F. Barclay and H. E. Mellor, Park Works, Manchester. Application date, May 5, 1922.

This electrolyser is intended for the production of sodium hypochlorite by the electrolysis of brine. In such electrolysers a circulation of the electrolyte has been produced by taking advantage of the reduced density of the electrolyte in the

cells due to the evolution of gas between the electrodes. It has been found that with such apparatus there is a flow of leakage current from the electrodes at the positive end of the electrolyser to the electrodes at the negative end, through the electrolyte in which the cells are immersed. In the present invention, the cells are provided with an opening *c* at the bottom sufficiently large to provide a free flow of electrolyte. Electrodes *a* are supported in a frame *b* of insulating material, having side walls *d* over which the electrolyte flows during electrolysis; these walls extend above the normal level of



the liquid. The space within the container *e* is divided into four compartments by insulating plates *f*, over which the electrodes are coupled at *g*. The electrical leakage in the whole apparatus is the sum of the leakages in the sections and therefore only a fraction of what it would be if the electrolyte in all the cells were in communication with a free space at the bottom. In the example shown, in which each section contains ten cells, the leakage current is reduced by this means to about five per cent. of what it would be without the partitions *f*.

201,302. Amino-Argento-Mercapto-Benzene Carboxylic Acid, Manufacture of a Complex. A. G. Bloxam, London. From Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-Main, Germany. Application date, May 16, 1922.

4-amino-2-mercapto-benzene-1-carboxylic acid is obtained by diazotising 4-nitro-2-amino-benzene-1-carboxylic acid, transforming the diazo compound with potassium sulphocyanide and cuprous sulphocyanide into the nitro-sulphocyanide of benzene-carboxylic acid, and treating this with a reducing agent. This compound is then treated with a silver salt, when the sulphydryl group enters into the reaction, but not the amino group, yielding a complex silver compound which in one example contains 42 per cent. of silver. This compound is used for the treatment of bacterial diseases.

201,332. Camphor, Production of. J. Schindelmeiser, Dorpat, Esthonia. Application date, June 6, 1922.

Camphor is obtained by treating borneol or iso-borneol in a finely divided state with air or other oxygen-containing gas in the presence of a catalyst consisting of highly active charcoal. The charcoal may be obtained by carbonising hard woods, saturating the charcoal with potassium carbonate solution, partly drying it in a retort, and then closing the retort and calcining the charcoal. The borneol is contained in a boiler, above which is arranged a tower containing a number of trays each having a thin layer of charcoal. Air at a temperature of 215° C. is injected into the borneol through a perforated pipe to evaporate it, and air at the same temperature is passed upwards through the tower to heat it to the same temperature. The products pass from the tower to a condenser where the camphor and unoxidised borneol are condensed. The camphor is separated by sublimation or fractional distillation.

201,488. Continuous Chlorination of Ligno- and Pecto-Cellulose by Nascent Chlorine for the Purpose of Obtaining Pure Cellulose. A. R. de Vains, 10, Rue Henri Grobon, Miribel, Ain, France. Application date, December 19, 1922.

The cellulose pulp is mixed with a small quantity of mineral acid, or an organic acid capable of separating chlorine from hypochlorites, and with a solution of an alkali or alkaline earth metal hypochlorite. Nascent chlorine is liberated and reacts with the ketones or other organic radicles and liberates hydrochloric acid so that the process is rendered continuous.

Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention:—185,728 (Etablissements Poulenc Frères), relating to the commercial preparation of aminophenyl arsinic acids and their derivatives, see Vol. VII., p. 684; 188,666 (Naamlooze Vennootschap Algemeene Norit Maatschappij), relating to drying gases, see Vol. VIII., p. 102; 197,932 (H. Pereira), relating to manufacture of dye from dioxyperylene, see Vol. IX., p. 102.

International Specifications not yet Accepted

199,706. Dyes. Soc. Chimique de la Grande Paroisse, 13, Rue des Saussaies, Paris. International Convention date, June 22, 1922.

The diazo compound from 4-nitro-2-aminophenol is subjected to the action of alkali polysulphide to obtain a green sulphide dyestuff.

199,713. Titanium Oxide, Titanium Sulphate, and Ammonium Sulphate. Titan Co. Aktieselskabet, Fredrikstad, Norway. International Convention date, June 24, 1922.

Compounds of titanium and nitrogen are treated with sulphuric acid at a raised temperature and pressure. If 50 per cent. sulphuric acid is used, heated to a temperature sufficient to produce a pressure of 25 atmospheres, and in amount slightly greater than that necessary to produce ammonium sulphate, the titanium may be obtained as oxide. If the quantity of acid is increased, titanium sulphate is obtained. The titanium oxide may be treated again in a similar manner to remove any remaining traces of nitride.

199,718. Treating Gases with Liquids. Farbenfabriken vorm. F. Bayer & Co., Leverkusen, near Cologne, Germany. International Convention date, June 20, 1922.

Two parallel shafts *a* are provided with discs *b*, the discs on one shaft projecting between the discs on the other shaft. The shafts rotate in opposite directions, and the discs are

FIG.1.

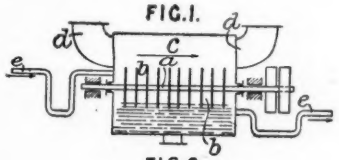
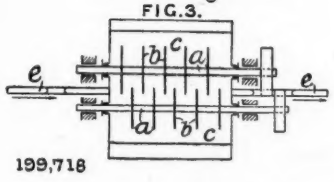


FIG.3.



199,718

immersed in liquid in the container, which is supplied and discharged through the pipes *e*. Gas is supplied and discharged through the pipes *d*, and comes into contact with the films of liquid moving in opposite directions carried by the discs.

199,720–1–2. Dyes. H. Pereira, 3, Freyung, Vienna. International Convention date, June 20, 1922.

199,720. Perylene quinone is nitrated by heating to boiling a mixture of perylene quinone, glacial acetic acid, and concentrated nitric acid. The first product is mononitro-perylene quinone, which is further nitrated on continued boiling to dinitro-perylene quinone. The product dyes cotton violet.

199,721. Dyes. H. Pereira, 3, Freyung, Vienna. International Convention date, June 20, 1922.

Mono- or di-nitro-perylene quinone may be reduced to the amino-perylene quinone by heating a suspension in caustic soda solution with sodium bisulphite, and blowing through it a current of air to precipitate the amino compound. Bromo-

dinitro-perylene quinone may be similarly reduced. The amino compound may be recrystallised from hot aniline or nitrobenzene.

199,722. The amino-perylene quinones are heated with acids or acid derivatives, to obtain acyl derivatives. In an example, a solution of diamino-perylene quinone in nitrobenzene is heated with benzoyl chloride, and dibenzoyldiaminoperylene-quinone is then precipitated by adding alcohol. A similar treatment, using anhydrous acetic acid instead of benzoyl chloride, yields the acetyl derivative. Bromo-diamino-perylene quinone may be heated with benzoyl chloride to yield the benzoyl derivative. These products dye cotton reddish shades.

199,743. SULPHONATED OILS. P. L. Guilleminot, 18, Rue d'Aumale, Chantilly, Seine-et-Oise, France. International Convention date, June 26, 1922.

An animal oil, such as fish oil, is mixed with iron filings or other metal, alloy or compound of the iron group, and concentrated sulphuric acid added to sulphonate the oil. Water is then added, and the product neutralised and washed. The oil is used in tanning, dyeing and soap-making.

LATEST NOTIFICATIONS.

202,613. Process for the manufacture of colloidal sulphur. Vogel, Dr. H. August 16, 1922.
202,616. Centrifugal separators. Aktiebolaget Separator. August 16, 1922.
202,629. Manufacture of sulphuric acid. Gaillard, E. A. August 17, 1922.
202,631. Process for the production of solutions of mercury derivatives of hydroxybenzene sulphonic acids and their homologues, suitable for use in therapeutics. Chemosan Akt.-Ges. August 17, 1922.
202,651. Manufacture of products from urea and formic aldehyde. Neuss, O. August 17, 1922.
202,660. Manufacture of new salts of C.C. di-substituted barbituric acids. Layraud, E. December 31, 1921.

Specifications Accepted, with Date of Application

191,064. 1-phenylimino-2-naphthoquinone, Manufacture of. Soc. Anon. des Matières Colorantes et Produits Chimiques de Saint Denis, A. E. Wahl, and R. Lantz. December 28, 1921.
193,802. Hydrocarbons, Process for the purification of. Allgemeine Ges. für Chemische Industrie. February 21, 1922.
201,968. Intimate mixtures of substances, Processes for producing, and for obtaining chemical products therefrom. J. W. Spensley and Chemical Engineering Co. (Manchester), Ltd. April 4, 1922.
201,986. Mineral oil, Refining of. P. T. Sharples. May 1, 1922.
202,016. Wood, Treatment of, for obtaining lignone in new derivative forms. C. F. Cross and A. Engelstad. May 8, 1922.
202,024. Hydrogen cyanide, Purification of gases from. J. G. Taplay and W. L. Galbraith. May 9, 1922.
202,078. Furnaces producing sulphurous gases. C. S. Imison, J. A. Bligh, R. R. Wright and J. F. Carmichael and Co., Ltd. May 22, 1922.
202,107. Retorting shale oil. H. L. Brown. June 14, 1922.
202,127. Electric furnaces. P. R. Kuenrich. July 1, 1922.
202,143. Filters. H. Bechhold. July 17, 1922.
202,157. Acetyl silk, Process for obtaining new shades on. British Dyestuffs Corporation, Ltd., J. Baddiley, J. Hill, and E. B. Anderson. July 29, 1922.

Applications for Patents

Appareils et Evaporateurs Kestner. Crystallisation processes. 21,303. August 22. (France, April 17.)
Badische Anilin- and Soda-Fabrik, and Johnson, J. Y. Manufacture of formic acid. 21,072. August 20.
Badische Anilin- and Soda-Fabrik, and Johnson, J. Y. Manufacture of oxygenated organic compounds. 21,386, 21,388. August 23.
Badische Anilin- and Soda-Fabrik, and Johnson, J. Y. Synthetic manufacture of methanol. 21,387. August 23.
Chemische Fabrik auf Actien vorm. E. Schering. Manufacture of viscous, etc., products. 21,412. August 23. (Germany, August 24, 1922.)
Cocksedge, H. E. Manufacture of sodium carbonate. 21,136. August 21.
Lancaster, R. C., and A. McLellan-Shields. Chemical heating-appliance. 21,160. August 21.
Layraud, E. Manufacture of new salts of C.C. disubstituted barbituric acids. 21,181. August 21. (France, December 31, 1921.)
Nelson, W. A. Process for obtaining nitrogen from the air. 21,103. August 20.
Noll, F. Manufacture of compounds containing active oxygen. 21,099. August 20. (Germany, August 28, 1922.)
Society of Chemical Industry in Basle. Process for producing fast tints on fibres. 21,078. August 20. (Switzerland, August 23, 1922.)
Wallace, W. M. Recovery of soda from solutions. 21,089. August 20.

The "Film" Principle in Evaporators and Driers

IN industrial applications of chemical processes, one of the most important problems confronting the chemical engineer is the removal of water from various products, either in reducing the bulk of liquors or evaporating them to dryness. This process is often wasteful of heat unless the apparatus is very carefully designed. Probably the most important condition for efficient working is that the liquor should not be in great bulk, but so disposed as to form a thin film only, and in this matter the "climbing film" evaporators introduced by Kestner are most ingenious. The principle of these evaporators depends on the fact that if there is a long vertical tube containing warm liquor to a height of a couple of feet or so from the lower end, and steam is circulated outside this tube, then when the liquor commences to boil, the vapour gradually causes a film of liquor to climb the side of the tube At the top of the tube, this liquor, which has become more concentrated owing to contact with the hot tube, may be collected and the vapour allowed to escape.

Several installations of Kestner evaporators working on the climbing film principle are illustrated and described in the latest catalogue issued by the Kestner Evaporator and Engineering Co., Ltd., 5, Grosvenor Gardens, London, S.W.1. Special types have been developed for dealing with acid liquors, sugars, milk, etc., and by means of triple and quadruple arrangements in which the hot vapours resulting from the first evaporation are used to heat the liquors in a second plant and so on as convenient, it is possible to arrange the plant to suit various requirements. Quadruple and quintuple arrangements are capable of giving extreme fuel economy where this is regarded as of greater importance than capital cost.

The same firm have more recently introduced an improved form of rotary drier for which a number of advantages are claimed. An interesting point about this machine, which is known as the Kestner Film Drier (Patented), is the application of the principle of working only with a thin film of the liquid which contains the product to be dried, either in solution or in suspension, resulting in a minimum of heat loss. The Kestner Film Drier is supplied in several patterns and sizes, which are illustrated and described in a leaflet distributed by the firm to those interested.

The Oxidation of Carbon by Bichromates

THE well-known method of oxidation of organic substances by a mixture of chromic and sulphuric acids has been recently re-examined by M. J. L. Simon, and the results, some of which were unexpected, have been communicated in a series of notes to the *Comptes rendus* of the Paris Academy of Sciences. With the usual mixture of potassium bichromate and sulphuric acid some compounds are completely, others only partially, oxidised. The substitution of silver bichromate for potassium bichromate in the mixture was found to give complete combustion in some cases where the classical mixture gave only partial oxidation. Pure graphite, using the silver oxidising mixture, was completely oxidised to carbon dioxide (with a trace of carbon monoxide) in half-an-hour at 100° C.; in the absence of silver the combustion was partial, from 66 per cent. to 72 per cent. being burnt. In the presence of silver diamond is not oxidised at all, while for various forms of charcoal, coke and coal, only from 1 per cent. to 6 per cent. is burnt. The fact that it is possible to oxidise graphite by thirds is considered to be in agreement with the view of a hexagonal distribution of the carbon atoms, and there is a marked experimental difference between graphite and certain varieties of black carbon which it is natural to attribute to a difference in constitution.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

London, August 30, 1923.

THERE is little change to report since our last issue, inquiry being maintained, although actual business is still far from good.

General Chemicals

ACETONE has been in steady demand, and the spot and forward positions are extremely firm.

ACID, ACETIC, is in good request and price a shade higher.

ACID, CITRIC.—Slightly lower prices are being quoted and demand is rather slower.

ACID, FORMIC, is in good request and higher prices are expected.

BARIUM CHLORIDE is in rather short supply and an increase in price is not unlikely.

BLEACHING POWDER has been slightly reduced for home trade; export demand is better.

CAUSTIC SODA.—English manufacturers advise reductions for home trade only.

CREAM OF TARTAR.—Price firm.

FORMALDEHYDE has been in good request and spot stocks are not heavy, although some large parcels are expected to arrive which will have an effect on the market.

LIME ACETATE is higher with good export and home trade demand.

POTASH CAUSTIC is unchanged, with only limited business passing.

POTASSIUM PRUSSIATE.—There is no further decline recorded, and there has been a fair amount of business put through.

SODIUM NITRITE is firmer and in good request.

SODIUM PHOSPHATE.—Price is inclined to go higher and there is a steady demand.

SODIUM PRUSSIATE is without change and a little more inquiry has been received.

SODIUM SULPHIDE is slightly firmer, with a better demand on export account.

ZINC SULPHATE is in steady request, with no change in price.

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID.—In better demand; price unchanged.

ACID, SALICYLIC.—Firm; spot supplies none too plentiful.

BROMIDES continue easy on an over-stocked market.

CAFFEINE.—A small business is passing, without change in price. Stocks are light.

EUCALYPTUS OIL has again advanced.

COCAINE has steadied at last prices.

HEXAMINE.—The outlook is firm. The best Continental makers are asking higher prices for fresh supplies.

SODA SALICYLATE is in steady demand; prices unchanged.

SALOL.—The advanced price is well maintained.

SULPHONAL.—Easier.

VANILLIN.—Unchanged.

Coal Tar Intermediates

ALPHA NAPHTHOL continues to be very firm, with stocks short, and some fair home orders have been offered.

ALPHA NAPHTHYLAMINE is unchanged in price, with only a moderate business passing.

ANILINE OIL.—This is considerably firmer and short for spot delivery.

ANILINE SALT is without change.

BENZALDEHYDE.—Export inquiries have been received, and available supplies do not seem excessive.

BENZIDINE BASE.—Some home business has been placed.

BETA NAPHTHOL.—Export inquiries have been received.

DIMETHYLANILINE is without change in price, and has been only a small business.

DINITROCHLORBENZOL.—Foreign buyers are interested.

"H." ACID has been a moderate business at recent values.

NAPHTHIONATE SODA is very firm, and spot stocks are short.

NITROBENZOL.—Rather more business has been passing.

PARANITRANILINE is unchanged from last week.

SULPHANILIC ACID has not been of particular interest.

Coal Tar Products

The steady tone of the market in coal tar products is maintained.

90% BENZOL is fairly plentiful at 1s. 5d. per gallon on rails.

PURE BENZOL is worth 1s. 9d. to 1s. 10d. per gallon on rails.

CREOSOTE OIL is rather more plentiful, and is quoted at 8¼d. to 8½d. per gallon on rails in the North, while the price in the South is 9¼d. to 9½d. per gallon.

CRESYLIC ACID is slightly easier, and has a very moderate demand. It is quoted at 1s. 10d. to 1s. 11d. per gallon for the pale quality 97/99%, while the dark quality 95/97% is worth from 1s. 8d. to 1s. 9d. per gallon.

SOLVENT NAPHTHA is weak, and is worth 1s. 2d. per gallon on rails.

HEAVY NAPHTHA is also in poor demand, and is worth 1s. 4d. to 1s. 5d. per gallon on rails.

NAPHTHALENES are plentiful, the lower qualities remaining in the region of £6 5s. to £7 per ton, while 74/76 and 76/78 are worth from £8 to £9 per ton.

PITCH.—The market is quiet, and somewhat lower prices have recently been mentioned. To-day's quotations are 145s. to 150s. f.o.b. London, 140s. to 145s. f.o.b. East and West Coast ports.

Sulphate of Ammonia

There is a fairly good demand and prices are unchanged.

[Current Market Prices on following pages.]

Russian Arsenic Production

THE Anil Trust is reported to have taken the Kurtatinsk factory for a period of twelve years with an undertaking to produce 30,000 poods of metallic arsenic per annum at least. It will pay a rent of one gold rouble per dessiatim of mining land, and 10 gold copecks per pood of extracted arsenic. The mines are amongst the richest in the world. First assays show 70 per cent. metallic arsenic in the ore, whereas the ordinary percentage is not over 30. The production of metallic arsenic will begin at the Derbent factory in January, 1924, where it is proposed to produce 40,000 poods of arsenate of calcium, soda and lead per annum—all for plant pests.

Sulphur Imports into Australia

A QUESTION arose some time ago in the Australian parliament respecting the importation of sulphur into Australia. It appeared that a quantity, other than 500 tons admitted duty free for the Sulphide Corporation, had been received at a lower duty than was specified under the Customs Tariff Act of 1921. It was stated that this concession was a temporary one, and would be withdrawn immediately Australian produced sulphuric acid was available. For this purpose plant was in course of erection at Broken Hill.

Japanese Chemical Imports

THE total value of Japan's import trade in 1922 was 1,890,308,232 yen, as compared with 1,614,154,832 yen in 1921. The principal commodities imported comprised chemicals (including zinc, lead, ores, phosphorite, nitrate of soda, soda ash, caustic soda, nickel, aluminium, acetate of calcium, copper, coal, salt, and sulphate of ammonium), paper and paper pulp, and coal tar dyes. The export trade for 1922, amounting to 1,637,451,818 yen, comprised chemicals (including menthol, crystal and copper).

Chilean Iodine Industry

CHILE treats an average of 15,000,000 tons of caliche a year, yielding 600 grains of iodine per ton. When nitrate is dear it has been customary to produce larger quantities of iodine. The exportations from Chile for 1919 were 429,000 kilos; 1920, 385,000 kilos; 1921, 488,000 kilos; 1922 (first six months), 138,000 kilos. The largest quantity ever exported in one year was 1,388,000 kilos.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99–100%	ton	71	0	0	to	72	0	0
Acetic, 80% pure	ton	50	0	0	to	51	0	0
Acetic, 40% pure	ton	25	0	0	to	26	0	0
Arsenic, liquid, 2000 s.g.	ton	85	0	0	to	88	0	0
Boric, commercial	ton	50	0	0	to	55	0	0
Carbolic, cryst. 39–40%	lb.	0	1	1½	to	0	1	2½
Citric	lb.	0	1	7½	to	0	1	8½
Formic, 80%	ton	50	0	0	to	51	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	38	0	0	to	39	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	26	0	0	to	27	0	0
Oxalic	lb.	0	0	6½	to	0	0	6½
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, technical	lb.	0	1	9	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	3½	to	0	1	4
Alum, lump	ton	12	10	0	to	13	0	0
Chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
.880	ton	32	0	0	to	34	0	0
.920	ton	22	0	0	to	24	0	0
Carbonate	ton	32	15	0			—	
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	35	0	0	to	37	10	0
Nitrate (pure)	ton	35	0	0	to	40	0	0
Phosphate	ton	65	0	0	to	68	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate, technical	ton	225	0	0	to	260	0	0
Arsenic, white powdered	ton	73	0	0	to	75	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip.	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	15	10	0	to	16	0	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	7	6	to	10	17	6
Borax crystals	ton	27	0	0	to		—	
Calcium acetate, Brown	ton	12	10	0	to	14	0	0
Grey	ton	22	0	0	to	23	0	0
Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	100	0	0	to	105	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	26	0	0	to	27	0	0
Cream Tartar, 98–100%	ton	92	0	0	to	93	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	90	0	0	to	93	0	0
Formusol (Eongalite)	lb.	0	2	1	to	0	2	2
Glauber salts, commercial	ton	4	0	0	to	4	10	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal	0	2	0	to	0	2	1
Iron perchloride	ton	18	0	0	to	20	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	43	0	0	to	45	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	37	0	0	to	39	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	3	10	0	to	3	15	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	5	15	0	to	6	0	0
Sulphate (Druggists')	ton	8	0	0	to	9	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	45	0	0	to	50	0	0
Methyl acetone	ton	78	0	0	to	80	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	37	0	0	to	38	0	0
Ammonium sulphate, double salt	ton	37	0	0	to	38	0	0

	Per	£	s.	d.		£	s.	d.
Potash, Caustic	ton	30	0	0	to	32	0	0
Potassium bichromate	lb.	0	0	5½	to	0	0	6
Carbonate, 90%	ton	30	0	0	to	31	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	3½	to		—	
Metabisulphite, 50–52%	ton	65	0	0	to	70	0	0
Nitrate, refined	ton	38	0	0	to	40	0	0
Permanganate	lb.	0	0	10	to	0	0	10½
Prussiate, red	lb.	0	3	0	to	0	3	2
Prussiate, yellow	lb.	0	1	1	to	0	1	2
Sulphate, 90%	ton	10	0	0	to	10	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	0	0	4½
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3	to	0	0	3½
Caustic, 70%	ton	17	10	0	to	18	0	0
Caustic, 76%	ton	18	10	0	to	19	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	27	10	0	to	28	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	1	0	to	0	1	1
Prussiate	lb.	0	0	6½	to	0	0	6½
Sulphide, crystals	ton	8	10	0	to	9	0	0
Sulphide, solid, 60–62 %	ton	14	10	0	to	15	10	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	0	0	to	11	10	0
Roll	ton	9	15	0	to	10	10	0
Tartar emetic	lb.	0	1	2	to	0	1	3
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw.	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	42	0	0	to	45	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	15	0	0	to	16	0	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	3	0	to	0	3	3
Acetanilid	lb.	0	1	6	to	0	1	9
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, I.21	lb.	0	2	3	to	0	2	6
Salicylic, B.P.	lb.	0	2	1	to	0	2	3
Tannic, leviss	lb.	0	3	2	to	0	3	4
Amidol	lb.	0	7	9	to	0	8	3
Amidopyrin	lb.	0	12	0	to	0	12	6
Ammon ichthosulphonate	lb	0	1	10	to	0	2	0
Barbitone	lb.	0	18	0	to	1	0	0
Beta naphthol resublimed	lb.	0	1	9	to	0	2	0
Bromide of ammonia	lb.	0	0	7	to	0	0	7½
Potash	lb.	0	0	6	to	0	0	6½
Soda	lb.	0	0	7	to	0	0	7½
Caffeine, pure	lb.	0	10	9	to	0	11	0
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	1	10	to	0	2	0
Calomel	lb.	0	4	0	to	0	4	3
Chloral hydrate	lb.	0	3	10	to	0	4	0
Cocaine alkaloid	oz.	0	18	6	to	0	19	0
Hydrochloride	oz.	0	15	9	to	0	16	3
Corrosive sublimate	lb.	0	3	8	to	0	3	10
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	2	3	to	0	2	6
B.P. (75–80% eucalyptol)	lb.	0	2	4	to	0	2	8
Guaiacol carbonate	lb.	0	8	3	to	0	8	6
Liquid	lb.	0	8	9	to	0	9	3
Pure crystals	lb.	0	9	3	to	0	9	9
Hexamine	lb.	0	3	8	to	0	3	10
Hydroquinone	lb.	0	3	3	to	0	3	6
Lanoline anhydrous	lb.	0	0	7	to	0	0	7½
Lecithin ex ovo	lb.	0	17	6	to	0	19	0
Lithi carbonate	lb.	0	9	6	to	0	10	0
Methyl salicylate	lb.	0	2	3	to	0	2	6
Metol	lb.	0	9	0	to	0	10	0
Milk sugar	cwt.	4	2	6	to	4	5	0
Paraldehyde	lb.	0	1	5	to	0	1	7½
Phenacetin	lb.	0	6	3	to	0	6	6
Phenazone	lb.	0	7	0	to	0	7	3
Phenolphthalein	lb.	0	6	9	to	0	7	0
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3			—	

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	6	to	0	5	9
Salicylate of soda powder	lb.	0	2	6	to	0	2	9
Crystals	lb.	0	2	8	to	0	2	9
Salol	lb.	0	3	0	to	0	3	3
Soda Benzoate	lb.	0	2	4	to	0	2	6
Sulphonal	lb.	0	14	0	to	0	14	6
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	10	6	to	0	11	0
Soda salicylate	lb.	0	7	6	to	0	7	9
Vanillin	lb.	1	3	0	to	1	4	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	0	to	0	2	3
Refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	1	6½	to	0	1	7
Aniline oil, drums extra	lb.	0	0	9	to	0	0	9½
Salts	lb.	0	0	9½	to	0	0	10
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	2	6	to	0	2	9
Benzidine, base	lb.	0	4	9	to	0	5	0
Sulphate	lb.	0	3	9	to	0	4	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	6	to	0	3	9
H-Acid	lb.	0	4	9	to	0	5	0
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	8	6	to	0	9	6
Naphthionic acid, crude	lb.	0	2	6	to	0	2	8
Naphthionate of Soda	lb.	0	2	6	to	0	2	8
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nevill Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	9	to	0	0	10
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	6	to	0	5	9
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	10	to	0	0	11
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.		£	s.	d.
Anise	c.i.f. 1/9 spot	0	1	11
Bay		0	12	0
Bergamot		0	12	0
Cajaput		0	3	6
Camphor, white	per cwt.	4	0	0
Brown	„	3	15	0
Cassia	c.i.f. 10/- spot	0	11	6
Cedarwood		0	1	4½
Citronella (Ceylon)	scarce and very firm, Aug.-Sept. 3/1	0	3	10
(Java)		0	4	1
Clove	easier	0	7	3
Eucalyptus	dearer	0	2	2
Geranium Bourbon	very firm	1	10	0
Lavender	firm	0	15	0
Lavender spike		0	3	0
Lemon		0	3	0
Lemongrass	per oz.	0	0	2½
Lime (distilled)		0	4	0
Orange sweet (Sicilian)	easier	0	12	0
(West Indian)		0	9	6
Palmarosa		1	3	0
Peppermint (American)	firm	0	13	0
Mint (dementholised Japanese)	„	0	7	3
Patchouli		1	10	0
Otto of Rose	per oz.	1	15	0
Rosemary	easier	0	1	7
Sandalwood		1	6	0
Sassafras		0	6	6
Thyme	2/6 to	0	8	0

Synthetics.			
Benzyl acetate	0	3	0
Benzoate	0	3	0
Citral	0	10	0
Coumarine	0	18	6
Heliotropine	0	8	0
Ionone	1	5	0
Linalyl acetate	1	2	6
Methyl salicylate	0	2	6
Musk xylol	0	11	0
Terpeniol	0	3	0

Liquidation of the Metallurgical Co., Ltd.

Failure Due to Abnormal Trading Conditions

On Friday, August 24, a meeting of the creditors of the Metallurgical Co., Ltd., Victoria Street, London, and Newcastle-on-Tyne, was held in London, under the chairmanship of Mr. G. H. Warmington, the liquidator.

The liquidator stated that the liabilities amounted to £7,420, but from claims which had been received it would appear that the figure would be increased by £1,400. The bank were creditors for £30,118, and as security they held a debenture over the assets for £75,000. There were also second debentures for £10,000. The preferential claims amounted to £8,300, of which £8,000 was in respect of income tax. The assets were estimated to realise £34,000. The company's success was dependent upon a normal amount of employment in the engineering trade. In 1919 there were large stocks of ingots in hand in various parts of the country which would have been satisfactorily absorbed if trade had been normal. The directors of the company had been endeavouring to effect a sale of the property as a going concern. The bank who held the first debentures gave notice that they would not allow the overdraft to remain any longer and appointed Mr. King, C.A., of Newcastle, to act as receiver. The latter was in possession of the assets, and if any surplus was available after the bank's claim had been settled he would have to pay £10,000 to the Disposals and Liquidations Board, who held a second debenture. There was a deficiency as regards the first debenture of something like £4,000, consequently there was nothing available for the Treasury or for the unsecured creditors. If the property could be sold as a going concern a much better price might be obtained for the assets. There was a possible claim against the Government in respect of a refund of excess profits duty running into some thousands of pounds.

The voluntary liquidation will be continued by the present liquidator.

Artificial Silk Developments

During the next few years there should be a greatly increased output of artificial silk, as fresh developments are taking place in Switzerland and other continental countries as well as in Jersey. New artificial silk works are, for example, being erected at Steckhorn by the Borvisk Company, which will be under German-Swiss control. Arbon is to be the *locale* of another plant, and production is taking place at Rorschach and Oberrheintal. A second factory is being erected at Emmenbrucke, near Lucerne, by the Société de la Viscose Suisse S.A. At Lobositz, Prague, the Bohemian Artificial Silk Works has been started, and is working the same process as the German company at Elberfeld. An English Syndicate has selected a site at Jersey for the erection of a mercerised silk factory. The place is easy of access from the railway which runs to Corbiere and Don Bridge, and it is believed that full time employment will absorb the activities of 2,000 hands.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, August 30, 1923.

BUSINESS during the past week has shown a little improvement, but orders booked are only for very limited quantities.

Continental offers are numerous, and shipments are being received fairly regularly.

Prices generally are as last reported.

Industrial Chemicals

ACID, ACETIC, GLACIAL.—98/100%, £60 to £64 per ton in casks; 80% pure, £50 to £53 per ton; 80% technical, £47 to £48 per ton, c.i.f., U.K. ports, duty free.

ACID, BORACIC.—Unchanged crystals or granulated, £50 per ton; powdered, £52 per ton, carriage paid U.K. stations, minimum ton lots.

ACID, CARBOLIC (ICE CRYSTALS).—Unchanged, at about 1s. 2d. per lb.

ACID, CITRIC.—Still lower, at about 1s. 5¾d. per lb., less 5%. Little enquiry.

ACID, FORMIC, 80%.—Unchanged, at £50 per ton.

ACID, HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID, NITRIC, 80°.—About £23 10s. per ton, ex station, full truck loads.

ACID, OXALIC.—Unchanged, at about 6d. per lb.

ACID, SULPHURIC.—144°, £3 15s. per ton; 168°, £7 per ton, ex works, full truck loads; Dearsenicated quality, 20s. per ton more.

ACID, TARTARIC.—B.P. Crystals, quoted 1s. 2d. per lb. less 5%, ex store.

ALUM, CHROME.—Moderate export enquiry. Price about £23 to £26 per ton, according to quality.

ALUM, POTASH (LUMP).—Quoted £9 10s. per ton, c.i.f., U.K. Spot lots about £11 per ton, ex store.

ALUMINA, SULPHATE.—17/18%, £10 10s. per ton, 14/15%, £7 5s. per ton, c.i.f., U.K. port.

AMMONIA, ANHYDROUS.—Remains unchanged at about 1s. 5d. per lb.

AMMONIA, CARBONATE.—Lump, 4d. per lb.; ground, 4½d. per lb. delivered.

AMMONIA, LIQUID, 880°.—Unchanged at about 3½ per lb., ex station. Containers extra.

AMMONIA, MURIATE.—Grey galvanizers quality, £32 to £33 per ton. Fine white crystals offered from Continent at £23 15s. per ton, c.i.f. U.K.

AMMONIA, NITRATE.—Recovered quality about £26 to £27 per ton.

AMMONIA, SULPHATE.—25¼%. £12 17s. per ton; 25¾%, neutral quality, £14 per ton, ex works, Aug.-Sept.

ARSENIC, WHITE POWDERED.—Moderate inquiry. Spot lots about £74 per ton, ex wharf. Slightly cheaper for forward delivery.

BARIUM, CHLORIDE.—98/100%. Spot lots offered at £15 per ton, ex store. Offered from Continent at £13, c.i.f. U.K.

BARYTES.—Finest white English, £5 5s. per ton, ex works.

BLEACHING POWDER.—Makers advise reduction of 2s. 6d. per ton. Now £11 5s. per ton, ex station, spot delivery. Contracts 20s. per ton less.

BORAX.—Granulated, £26 10s. per ton; crystal, £27 per ton; powdered, £28 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English make, £5 12s. 6d. per ton, ex station. Continental material offering at £4 10s. per ton, c.i.f. U.K.

COPPERAS, GREEN.—About £2 2s. 6d. per ton, f.o.b., U.K. port.

FORMALDEHYDE, 40%.—Quoted £93 to £94 per ton, ex wharf, early shipment. Spot lots about £96 to £97 per ton.

GLAUBER SALTS.—Fine white crystals quoted £3 15s. per ton, ex store.

LEAD, RED.—English makers' price £40 per ton, carriage paid, U.K. stations. Continental material about £34 15s. per ton, ex store.

LEAD, WHITE.—Offered from Continent at £36 per ton, c.i.f., U.K. ports.

LEAD ACETATE.—White crystals about £41 per ton, ex store. Spot quoted £39 per ton, ex wharf, early shipment.

MAGNESITE, GROUND CALCINED.—English burnt material, £8 5s. per ton, ex station. Finest Continental, about £7 5s. per ton, c.i.f., U.K. ports.

MAGNESIUM CHLORIDE.—Continental prices higher. About 37s. 6d. per ton, c.i.f., U.K. Spot lots, £2 15s. per ton, ex store.

MAGNESIUM SULPHATE (Epsom Salts).—Commercial quality, £7 per ton; B.P. quality, £8 5s. per ton, ex station. Continental commercial crystals quoted £4 per ton, ex store.

POTASH, CAUSTIC, 88/92%.—Spot lots offered at about £31 per ton, ex wharf.

POTASSIUM BICHROMATE.—Unchanged at 5¾d. per lb., delivered.

POTASSIUM CARBONATE.—96/98%, quoted £28 10s. per ton, c.i.f. U.K. Spot lots about £29 5s. per ton, ex store. 90/92% quality about £27 10s. per ton, ex store.

POTASSIUM NITRATE (SALTPETRE).—Offered at £23 per ton, c.i.f. U.K. port.

POTASSIUM CHLORATE.—Unchanged at about 3d. per lb.

POTASSIUM PERMANGANATE.—B.P. crystals on offer at 10½d. per lb., ex store.

POTASSIUM PRUSSIATE (YELLOW).—Still lower at about 1s. 1½d. per lb., ex store.

SODA, CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d. per ton; 98/99% powdered, £22 15s. per ton. All ex station spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Quoted £25 10s. per ton, ex store, spot delivery. About £24 per ton, ex wharf, prompt shipment from Continent.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4½d. per lb., delivered.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station. Alkali, 58%, reduction of 1s. 3d. per ton. Now £8 14s. 9d. per ton, ex quay.

SODIUM HYPOSULPHITE.—Continental commercial crystals offered at £7 15s. per ton, c.i.f. U.K. Spot lots about £9 10s. per ton, ex store. Pea crystals, £14 10s. per ton, ex store.

SODIUM NITRATE.—Refined, 96/98% unchanged at about £13 7s. 6d. per ton, f.o.r. or f.o.b. U.K. port.

SODIUM NITRITE.—100%, £26 to £28 per ton, according to quantity.

SODIUM PRUSSIATE (YELLOW).—Now quoted at about 6¾d. per lb., ex store.

SODIUM SULPHATE (SALTCAKE).—Unchanged at about £4 per ton, ex station for home consumption. Higher prices for export.

SODIUM SULPHIDE.—60/62%, solid, offered from the Continent at £13 5s. per ton, c.i.f. U.K. Spot lots about £14 10s. per ton, ex store.

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 4d. per lb.

ZINC CHLORIDE.—English material about £25 per ton. Continental about £23 per ton, c.i.f. U.K. ports.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHYLAMINE.—Good inquiry for export. Quoted at 1s. 6½d. per lb., f.o.b. U.K. port.

ANTHRAQUINONE.—Good export inquiry. Offered at 2s. 6d. per lb., f.o.b. U.K. port.

BETA NAPHTHOL.—Considerable inquiry for export. Price quoted 1s. 1d. per lb., f.o.b. U.K. port.

DIMETHYLANILINE.—Fair home inquiry. Price firm at 2s. 11d. per lb., packages returnable.

DIMETHYL SULPHATE.—Small inquiry. Price 3s. per lb. delivered, packages extra.

GAMMA ACID.—Some inquiry for export. Offered at 13s. per lb., 100% basis, f.o.b. U.K. port.

METHYL ALCOHOL 99/100%.—(Maximum 0·1% Acetone.) Offered at £96 per ton, c.i.f. Liverpool, drums free.

NAPHTHIONATE OF SODA CRYSTALS.—Some home inquiry. Quoted at 2s. 8½d. per lb., 100% basis, delivered.

PARA AMIDOACETANILIDE.—Some inquiry. Offered at 5s. 2d. per lb., delivered, 100% basis.

PURE BENZOL.—Offered at 1s. 9d. to 1s. 10d. per gallon, delivered.

Trade Between Great Britain and Finland

A STATISTICAL statement just issued by the Consul-General for Finland shows that during the first half of the current year "stones and earths and wares thereof" imported into Finland from Great Britain were of the value of £251,907; metals and metal goods, £212,012; asphalt, tar, rosin, indiarubber and articles of which they were constituents, £60,647; chemical elementary substances and compounds, £55,745; oils, fats, wax, and articles composed of those materials, £41,092; colours and dyes, £15,441; fertilisers, £3,190; ether, alcohol, &c., £1,468; explosives, fireworks, etc., £135. Finland's exports to Great Britain included pulp, paper boards and paper, £1,114,397; matches, £61,847; stones and earths and wares thereof, £8,075; ether, alcohol and articles made from these elements, £3,426; asphalt, tar, rosin, indiarubber and articles made from them, £1,510; metals and metal goods, £208; chemical elementary substances and compounds thereof, £24.

Goods in the import list under the heading "Metals and metal goods" include pig iron, sheet iron, tinplates, lead, tin, copper, spikes, nails, rivets, bolts, nuts, rails, and tramway material; under "Machinery and appliances" boilers for power stations, cellulose boilers, and paper-making machinery; and under "Stones and earths," china clay, coal, porcelain and glassware.

Statistics relating to Finland's international trading relations show the following exports:—

	1922 tons	January-June 1923 tons
Chemical pulp	183,945	103,111·5
Mechanical pulp	51,516	23,012·9
Pulp boards	24,689	12,325·4
Paper	192,141	87,965·2
Printing paper	130,082	62,162·8

The imports for the same periods include the following: Oilcakes, 1922, 7,124 tons; January-June, 1923, 8,592·5 tons. During 1921 Finland transacted business in the following industries to the values named in Finnish marks: paper, 1,270,900,000; metals, 186,869,000; tar, 131,293,000; chemicals, 102,280,000.

Exclusion of Water from Oil Wells

MR. M. J. KIRWAN, petroleum engineer of the Department o the Interior, attached to the Bartlesville, Okla., experiment station of the U.S.A. Bureau of Mines, is continuing laboratory experiments on the use of mud fluid and cement in excluding water from oil wells. Data regarding the viscosities and rate of settling have been secured on about fifty samples of mud fluid. A number of tests have been made to determine the penetration of mud fluid of different gravities into unconsolidated sands. Laboratory tests have been started to determine the rate of settling of mud fluid when various electrolytes are added. The effect of gas agitation on mud fluid is being studied. Data are being secured on the tensile and compression strength of cement mixed with various amounts of water. Tests are being made to determine the volume of set cement when different proportions of water are used. The amounts of water used in these tests are varied in accordance with the field practices of different oil operators.

The Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, August 30, 1923.

THERE have been a few further price concessions during the past week, but with one or two exceptions they have been comparatively unimportant. A satisfactory feature of the market has been an improvement in the demand from home consumers; foreign inquiries, also, have been on a rather more iberal scale. Traders here are chary, however, of expressing an opinion as to whether the improvement will be a lasting one.

Heavy Chemicals

Caustic soda still sells in rather good quantities for home and export at the revised prices of £16 17s. 6d. per ton for 70 per cent. and £19 7s. 6d. per ton for 76-77 per cent. material. Soda crystals are quiet, but prices are maintained at £5 5s. per ton delivered. Bicarbonate of soda is firm at £10 10s. per ton delivered; home trade business is still only moderately active, though export inquiry keeps up. Bleaching powder is in fairly good demand at £11 5s. per ton to home users. Prussiate of soda shows no sign of improvement, with prices about unchanged at 6d. to 6½d. per lb. Saltcake is firm at £4 10s. per ton, the export demand being fairly active. Glauber salts are quiet but steady at round £4 per ton. Hyposulphite of soda is inactive and prices are easier at £13 10s. per ton for photographic crystals and £9 10s. per ton for commercial. Alkali is being steadily called for on home and foreign account and prices are firm at £7 12s. 6d. per ton for 58 per cent. material. Sodium sulphide is still a dull section at £14 10s. for 60-65 per cent. concentrated solid and £8 per ton for crystals. Nitrite of soda is quite firm at £26 10s. per ton, demand having improved a little with supplies still short. Sodium chlorate is steady and just moderately active at 2¾d. per lb. Phosphate of soda is still quiet at round £15 per ton. Bichromate of soda is unchanged at 4½d. per lb., a fair amount of business being put through. Acetate of soda is steady again at £24 to £24 10s. per ton, though the demand is restricted.

Caustic potash is quiet and easy at about £28 10s. per ton for 88-90 per cent. material. Carbonate of potash is quiet at round £27 10s. for 90-92 per cent. and £29 for 96-98 per cent. Yellow prussiate of potash keeps very inactive at 1s. 1½d. to 1s. 2d. per lb. Permanganate of potash is steady at 9½d. per lb., but the demand is quiet. Chlorate of potash is in moderate request at 2¾d. to 3d. per lb. Bichromate of potash is firm and in fair demand at 5¾d. per lb.

Sulphate of copper shows no improvement in foreign trade, though quotations are about maintained at round £26 per ton, f.o.b. Arsenic is offered at round £70 per ton in Manchester for white powdered, Cornish makes, but the demand is quieter; cheaper offers of Continental brands are being made. Nitrate of lead is rather dull, but prices are steady at round £42 per ton. White sugar of lead is quoted at £41 and brown at £42 to £43 per ton. Acetate of lime is quiet but steady at £20 for grey and £11 per ton for brown. Commercial Epsom salts are firm and in quiet demand at £4 to £4 5s. per ton; magnesium sulphate, B.P., is offered at about £6.

Acids and Tar Products

Acids generally are rather quiet but unchanged from last week. Tartaric acid is on offer at 1s. 2d. to 1s. 2½d., and citric, B.P. crystals, at 1s. 7d. per lb. Oxalic acid continues dull at 5½d. per lb. Acetic acid is steady at £46 to £47 per ton for 80 per cent. technical and about £65 per ton glacial.

There is a lull in the export inquiry for pitch and prices are nominal at about £7 per ton Manchester. Creosote oil is again quiet at 8½d. per gallon. Solvent naphtha is featureless at 1s. 4½d. per gallon. Carbolic acid firm on scarcity of offers, crude being quoted at 3s. 4d. per gallon and crystals at 1s. 4d. per lb. Naphthalenes are only in quiet demand, though prices are maintained at about £20 for refined and £7 to £13 per ton for crude.

Company News

ACHILLE SERRE, LTD.—The directors recommend a dividend at the rate of 10 per cent.

PATENT VICTORIA STONE.—The directors recommend an interim dividend of 4 per cent. on ordinary shares, the same as last year.

STANDARD CHEMICAL CO.—The official report states that the net profit for the year to March 31 is $42,626, reducing the debit balance to $581,462.

DOMINION TAR AND CHEMICAL COMPANY.—The directors announce a final dividend of 2½ per cent., making 5 per cent. for the half year ended June 30.

INTERNATIONAL PAINT AND COMPOSITION CO.—The directors announce an interim dividend of 3 per cent. on the preference shares, but none on the ordinary stock.

MANGANESE BRONZE AND BRASS CO.—The directors state that owing to depression in the shipbuilding trade the dividend on the 6 per cent. preference shares will not be paid.

BRITISH BROKEN HILL PROPRIETARY CO.—The liquidator announces a first and final dividend of 35s. per share, payable on September 24 to all shareholders now on the register.

THE NEWFOUNDLAND POWER AND PAPER CO.—It is announced that the company have obtained authority for quotation on the London Stock Exchange for their £2,000,000 4½ per cent. "A" mortgage debenture stock, and their £2,000,000 5½ per cent. "B" mortgage debenture stock.

CALICO PRINTERS' ASSOCIATION, LTD.—The directors announce a dividend for the year of 10 per cent. on ordinary shares, with a bonus of 2½ per cent. The net profit amounts to £800,208, which, with £237,371 brought forward, makes a total of £1,037,579. As to the allocation of the profit, £150,000 is placed to reserve, £150,000 to the dividend equalisation fund, and £10,000 is added to the employees' benefit fund, leaving £235,432 to be carried forward.

GOODLASS, WALL AND CO.—At the annual meeting, on August 23, the chairman, Mr. John Byrne, stated that the company had had a very prosperous year, due, he considered, to their products, chiefly paints and varnishes, being of a uniform high grade. The directors had decided on the extension of Liverpool premises and the installation of further modern plant. The Cardiff works practically had been rebuilt and equipped with new machinery. The company's investments had increased to £68,000. The directors recommended a dividend of 12½ per cent. on the ordinary shares.

VIRGINIA CAROLINA CHEMICAL.—Accounts to May 31 show a net loss, after providing for depreciation, bond interest, and guaranteed dividend of 7 per cent. on Consumers' Chemical Corporation preferred stock, of $2,894,326. The surplus brought in amounted to $6,296,449, to which is added $15,741,225 arising from reduction of valuation of common capital stock. After deducting loss, a special provision of $2,400,000 for doubtful accounts, $5,059,603 cost of retirement of old bonds and cost of new issues, and $226,034 miscellaneous adjustments, the surplus stands at $11,456,704.

BROKEN HILL PROPRIETARY CO.—Reports to hand this week show that the position of the company is much more favourable than was shown in the brief statement issued three weeks ago, when a loss of £106,086 for the year to May 31 was announced. The recent report conveys the impression that the resumption of operations was justified, although £100,000 was transferred from the reserve to appropriation fund. The accounts for last year cover nine months' idleness and three months' working; they also bear the costs of restarting, which were heavy. Further, it was not possible to realise the full benefits of all the improvements effected before the close of the year owing to a cessation of work at the Maitland Collieries. Since the resumption of work a satisfactory flow of orders has been received.

Tariff Changes

MEXICO.—A decree has been signed by the President of Mexico exempting from duty all petroleum imported into that country for refining. It is understood that the object of this decree is to assist the Mexican refineries to continue in operation.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. No.
Canada	British producer of China clay..	245
Warsaw	Chemicals	254
Lausanne	Drugs	256
San Francisco	Ferro-alloys, China clay, fuller's earth	264
San Francisco	Sulphate of ammonia, fish oils, fishmeal and whale guano	265

"Chemical Age" Inquiry List

The following inquiry has been received from a reader of "The Chemical Age." Replies addressed to the box number given below, c/o "The Chemical Age," 8, Bouverie Street, London, E.C.4, will be forwarded to the inquirer.

GERMAN LITHOPONE.—A British firm of chemical merchants desires to get in touch with a German manufacturer or manufacturers of Green Seal Lithopone, 30 per cent. quality.—No. H28.

Contract Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

BRITISH INDIES (September 5).—Red and white lead. Copies of the specification can be obtained at the company's offices, 73–76, King William Street, London, on payment of one guinea each. This fee is not returnable.

Tar or Tar Substitute for South Africa

H.M. SENIOR TRADE COMMISSIONER in South Africa (Mr. W. E. G. Wickham) reports a call for tenders for the supply of 1,800 tons of tar or tar substitute. Applications for further particulars should be addressed to the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W.1.

Cement for South Africa

CEMENT imported into South Africa last year amounted to 248,376 casks, although there are four factories in the country capable of yielding 2,125,000 casks. The imports for 1921 were 181,483 casks. Great Britain, Belgium, Norway and Denmark supplied the bulk of the material. The import duty is 1s. 3d. per cask, with a rebate of 3d. on the British product; but last year further protection was given the home article in the form of a special dumping duty as affecting cement sent from Britain and the other countries named. At the same time South African cement prices have been reduced, and compare favourably with the rates of other countries.

Trade with Cuba

MR. E. V. B. BRICE, British Consul at Santiago de Cuba, who is now on a visit to the United Kingdom, will be pleased to interview firms interested in trade with Cuba, particularly Eastern Cuba, at the Department of Overseas Trade, from August 28 to September 8 inclusive. These interviews will be given only by appointment and applications should be addressed to the Comptroller-General of the Department, 35, Old Queen Street, London, S.W.1. In all cases the reference 8622/F.L. should be quoted.

Italy as Castor Seed Grower

A CONFERENCE has been held at the Italian Ministry of Agriculture to consider the question of growing castor seed in order to furnish lubrication oil for aviation and other transport purposes. It is believed a considerable crop of castor seed could be grown throughout the southern provinces of Italy. At present there is a large import of castor oil from British India.

THE BRITISH ALIZARINE COMPANY LTD.

Manchester London Glasgow

Manufacturers of Alizarine Dyestuffs

ALIZARINE RED (all shades)

ALIZARINE BLUES (soluble and insoluble)

ALIZARINE BORDEAUX

ALIZARINE CYANINE

ALIZARINE GREEN (soluble and insoluble)

ALIZARINE ORANGE

ALIZARINE RED S. POWDER

ALIZARINE BLUE BLACK

ALIZARINE (MADDER) LAKES (of all qualities)

ALIZARINE MAROON

ALIZUROL GREEN (Viridine)

ANTHRACENE BROWN

ALIZANTHRENE BLUE

ALIZANTHRENE BROWN

ALIZANTHRENE YELLOW

Other fast colours of this series in course of preparation

Anthraquinone, Silver Salt and all intermediates of this series

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CHROME TANNING and other Chrome Compounds

TELEPHONES
663 Trafford Park, MANCHESTER
560 EAST LONDON
2667 DOUGLAS, GLASGOW

TELEGRAMS
BRITALIZ MANCHESTER
BRITALIZ LONDON
BRITALIZ GLASGOW

All communications should be addressed to

The British Alizarine Co., Ltd.
Trafford Park, Manchester

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BOULTON AND SKELTON, LTD., 86, Victor Street, Grimsby, chemists. (C.C., 1/9/23). £13 6s. 8d. June 26.

LEIGHTON LABORATORIES, LTD., 35, Grays Inn, chemist. (C.C., 1/9/23). £17 15s. 10d. June 4.

POMERANTZ, Harry, 85, Roman Road, Bow, drug merchant. (C.C., 1/9/23). £13 9s. 4d. July 5.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

BROOKSBANK (E.) AND CO., LTD., Manchester, oil refiners and soap manufacturers. (M., 1/9/23.) Registered July 30, mortgage to National Provincial and Union Bank of England, Ltd., securing all moneys due or to become due to the bank; charged on company's land, buildings, plant, machinery, etc., also general charge. *Nil. December 12, 1922.

CLEMENT AND JOHNSON, LTD., London, W.C., chemists. (M., 1/9/23). Registered August 17, £500, £300, £100, £100, £100, £500 and £200 debentures part of £60,000; general charge. *£38,700. January 12, 1923.

LAMPLOUGH (F.) AND CO., LTD., London, S.W., oil and manufacturing chemists. (M., 1/9/23.) Registered July 27, Trust Deed dated July 10, 1923, securing £20,000 debentures and bonus of 30 per cent. on redemption; charged on interest in land at Feltham, company's rights in certain provisional specifications, etc., also general charge.

LEEDS FLINT GLASS CO., LTD. (M., 1/9/23.) Registered August 10, £2,000 2nd debentures (filed under section 93 (3) of the Companies (Consolidation) Act, 1908), present issue £700; general charge (subject to 1st debentures). *£10,200. June 28, 1923.

PICKLES, AYLAND AND CO., LTD., Ossett (Yorks), chemists. (M., 1/9/23). Registered August 14, £2,000 debenture, to A. Kilbank, The Screeds, Ashby, works manager; general charge. *To secure bank overdraft, no amount stated, approximately £1,100. December 30, 1922.

SHIPLEY CARBONIZING CO., LTD. (M., 1/9/23.) Registered August 10, £12,500 debenture and mortgage for same amount as further security, to C. Whittingham, Harpsden Wood House, Henley-on-Thames; general charge and land with works, etc., thereon at Ashley Lane, Shipley, respectively.

SNELLING AND SONS, LTD., Norwich, tallow refiners. (M., 1/9/23.) Registered August 7, £8,000 debentures, part of £33,000; charged on various premises at Norwich, also general charge. *Nil. November 9, 1922.

TAYLORS' DRUG CO., LTD., Leeds. (M., 1/9/23.) Registered August 7, £1,000 mortgage, to Emily Wight and another, Combermere, The Drive, Roundhay; charged on 21, Hope Street, Crook, Brancepeth. *£74,796 0s. 3d. January 3, 1923.

THAMES CHEMICAL CO., LTD., Watford. (M., 1/9/23). Registered August 4, £3,000 debentures; general charge. *Nil. December 31, 1921.

TOMLINSON AND CO., LTD., Stairfoot, flint glass manufacturers. (M., 1/9/23.) Registered July 30, £4,000 debenture, to Branch Nominees, Ltd., 15, Bishopsgate E.C.; general charge. *Nil. May 9, 1923.

WILKINSON (L. G.), LTD., London, E.C., french polish, manufacturers. (M., 1/9/23). Registered August 14, charge, to Bank; charged on 52, Scrutton Street, E.C. *Nil. September 29, 1922.

Satisfactions

PEARSON (E. T.) AND CO., LTD., London, W.C., manufacturing chemists. (M.S., 1/9/23.) Satisfaction registered August 13, £2,250, registered October 13, 1919.

SOUTH AFRICAN CARBIDE AND BY-PRODUCTS CO., LTD., London, E.C. (M.S., 1/9/23.) Satisfaction registered August 14, £360, part of amount registered April 8, 1922.

WHITE (TIMOTHY) CO., LTD., Portsmouth, chemists. (M.S., 1/9/23.) Satisfaction registered August 13, £100,000, registered January 17, 1905.

London Gazette

Company Winding Up Voluntarily

HOLYWELL SOAP CO., LTD. (C.W.U.V., 1/9/23.) C. Bradburn, Bank Chambers, 3, Cook Street, Liverpool, appointed Liquidator.

Notice of Intended Dividend

ROWLEY, Albert James, 36, Heathfield Gardens, Chiswick, lately carrying on business at Crown Works, Brentford, paint and varnish manufacturer. Last day for receiving proofs, September 8. Trustee, T. Gourlay, 29, Russell Square, W.C.1, Official Receiver in Bankruptcy.

New Companies Registered

ASHTON, SIDNEY, LTD., 103A, Lapwing Lane, West Didsbury, Manchester. Chemists, druggists, drysalters, oil and colourmen, importers and manufacturers of and dealers in pharmaceutical, chemical, industrial and other preparations; makers of and dealers in chemical, surgical and scientific apparatus, etc. Nominal capital, £1,000 in £1 shares.

CONTRACT WORKS AND COAL SUPPLY CO. (GRIMSBY), LTD., 5, Osborne Terrace, Grimsby. Dealers in peat, patent fuel and derivatives of coal and oil, pitch, tar, creosote, fireclay, etc. Nominal capital, £1,000 in £1 shares.

UNITED FERTILISER CO., LTD. Importers, exporters and manufacturers of and dealers in fertilisers and merchandise of all kinds. Nominal capital, £2,100 in 2,000 ordinary shares of £1 each and 2,000 founders' shares of 1s. each. A director: C. H. Cook, Little Stone Stile, Selling, near Faversham.

Limited Partnership

SELF-LIGHTING GAS MANTLE CO.—Registered August 21st. Importers and manufacturers of self-lighting gas mantles and materials for treating the same, 14, New Bridge Street, E.C. Partnership for ten years from July 17th, 1923. General partners: C. Fenton and E. T. Smith, 14, New Bridge Street, E.C. Limited partner: J. S. Holland, 88, Fenchurch Street, E.C., contributing £500 in cash.

Evening Classes in Technical Chemistry

THE Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C., reopens for the session 1923-24 on September 20. There is a large department of chemistry in which lectures and laboratory work are arranged to meet the requirements of those engaged in chemical industries or trades associated with chemical products. There are special courses of instruction in the Fermentation Industries and Petroleum Technology. Classes are arranged in the evenings, and a systematic course occupies up to five years. Students may take the examinations of the University of London or of the Institute of Chemistry.